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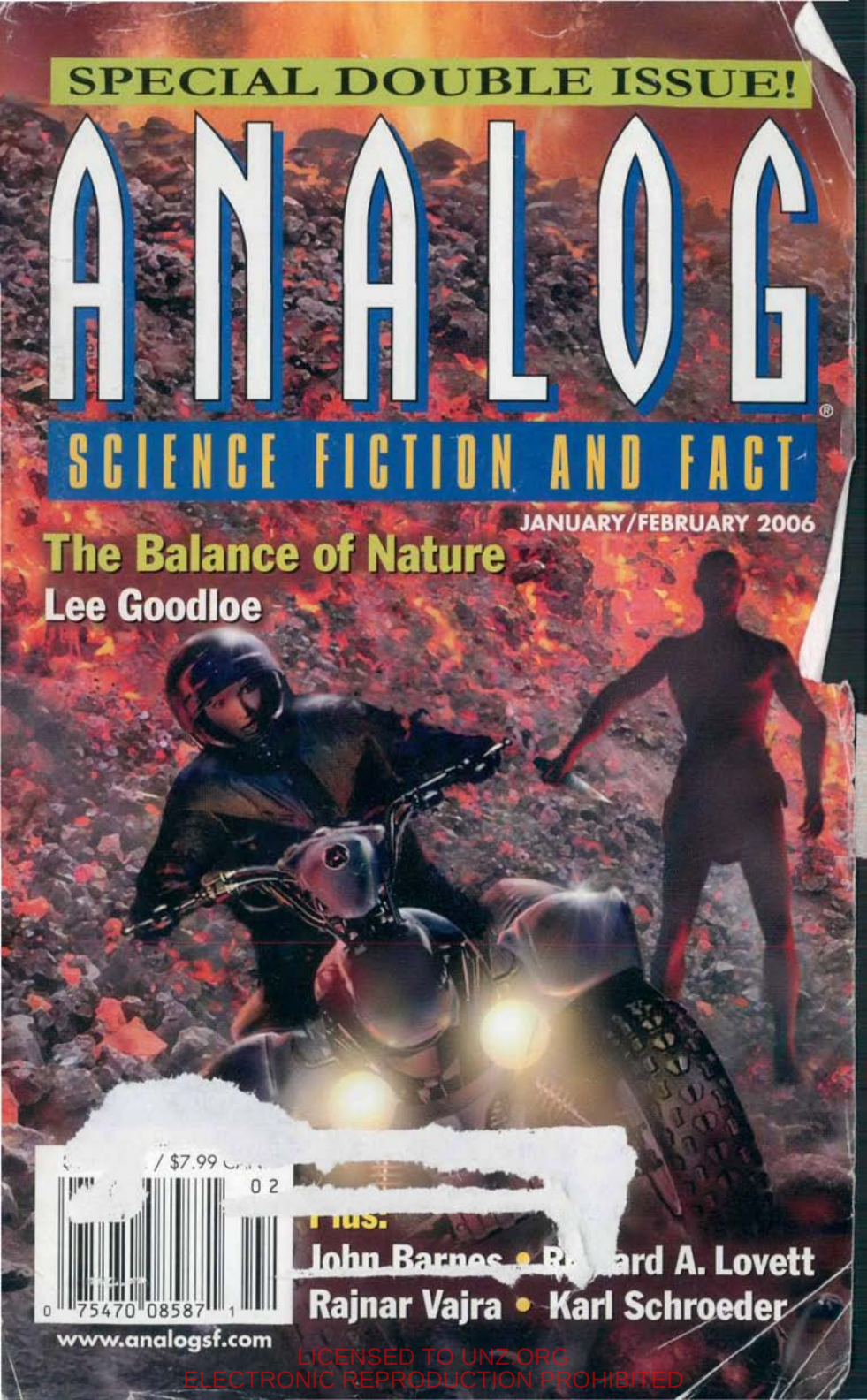

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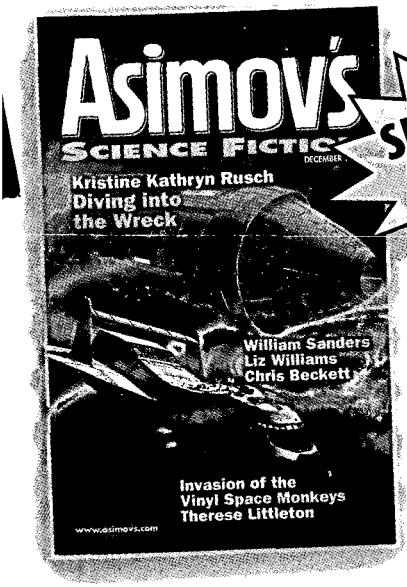

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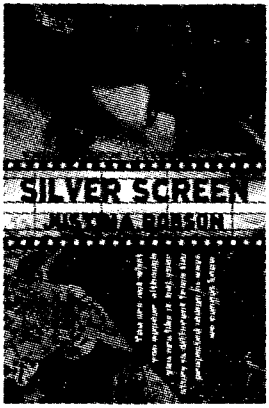

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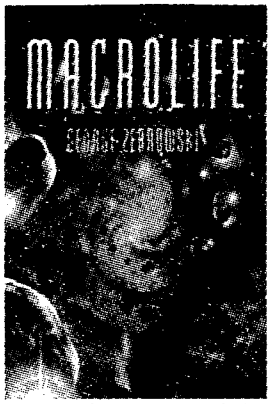

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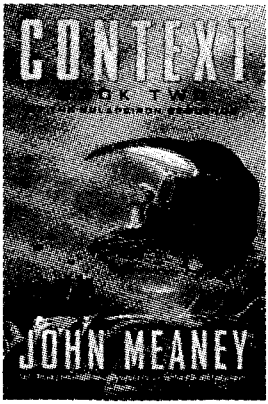

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Vol. CXXVI No. 1
January/February 2006

Next Issue on Sale
December 28, 2005

SERIAL

SUN OF SUNS pt III, Karl Schroeder ____ 180

NOVELLA

"THE NIGHT IS FINE," THE WALRUS SAID, John Barnes ____ 144

NOVELETTES

THE BALANCE OF NATURE, Lee Goodloe ____ 8

DINOSAUR BLOOD, Richard A. Lovett ____ 40

WRITTEN IN PLASTER, Rajnar Vajra ____ 104

SHORT STORIES

MOP-UP, Grey Rollins ____ 60

KAMIKAZE BUGS, Ekaterina Sedia & David Bartell ____ 72

REPORT ON RANZIPAL'S
PLUS-DIMENSION CARRY-ALL, Mark W. Tiedemann ____ 97

CHANGE, Julian Flood ____ 128

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p.72

p.180

SCIENCE FACT

POLLUTION, SOLUTIONS, ELUTION,
AND NANOTECHNOLOGY, Stephen L. Gillett, Ph.D. ____ 28

FROM FIMBULWINTER TO DANTE'S HELL:
THE STRANGE SAGA OF SNOWBALL EARTH, Richard A. Lovett ____ 86

SPECIAL FEATURES

WHY DO READERS ALWAYS ASK. . . ?, James P. Hogan ____ 134

READER'S DEPARTMENTS

THE EDITOR'S PAGE ____ 4

THE ALTERNATE VIEW, Jeffery D. Kooistra ____ 140

THE REFERENCE LIBRARY, Tom Easton ____ 224

BRASS TACKS ____ 230

THE 2005 INDEX AND ANALYTICAL LABORATORY BALLOT ____ 236

IN TIMES TO COME ____ 229

UPCOMING EVENTS, Anthony Lewis ____ 240

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Indicia on Page 5

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THE ANTHROPOCENTRIC PRINCIPLE

It's been more than a century since Mark Twain observed that many of our human kind consider us "The Creator's Pet." No doubt he would have been impressed, to say nothing of amused, to see how much further some of us have now carried that notion: Some would have us believe we are the very *raison d'être* of the universe itself.

How's that for modesty?

The claim isn't presented without supporting arguments, of course, but it seems that the rules of logic become quite flexible when questions of species self-esteem and cosmic self-importance are at stake.

The "anthropic principle" is just one of the more obvious and striking examples. It exists in several variations, but basically asserts that the universe was designed to make us possible. That sounds like quite a claim, but it was inspired by a real observation: that if you make even a small change in any of the fundamental constants of physics (electron and proton masses, unit charge, Planck's constant, gravitational constant, speed of light, etc.), the kind of life-bearing universe we have becomes impossible. (For a fuller discussion see, for example, Richard D. Meisner's article "Universe—The Ultimate Artifact?" in the April 1987 *Analog*, and the letters commenting on it in the Mid-December 1987 and January 1988 issues.)

To some people, the fact that our existence depends so sensitively on the physical constants being what they are suggests a cause-and-effect relationship. Richard Meisner, in his article mentioned above, summarizes an argument by physicist R. Dicke that runs like this: Intelligent life requires habitable planets; habitable planets require stars that radiate stably for billions of years; such long periods of stability are available in an expanding universe only if the density of the universe is very low—so the size and emptiness of the universe determined by those constants, instead of underlining the insignificance of intelligent life, are prerequisites for such life.

Prerequisites, yes; but to claim, as some do, that this state of affairs implies that the universe was made this way for the *purpose* of making intelligent life possible, seems to me a classic, even monumental, case of putting the cart before the horse. Furthermore, there's a weakness in the starting premise of that argument: Why assume that intelligent life requires habitable planets? Yes, our particular kind of intelligent life does, but who says that ours is the only possible kind?

Certainly the "intelligent design" theorists don't. They would have us believe that the universe's being the way it is requires deliberate design by an intelligence far superior to our own. Since that intelligence presumably antedates the universe it created to make us, it apparently *doesn't* require what we call habitable planets. So if you accept the conclusion, it invalidates by counterexample the initial premise of the argument that led to it!

But then, logic stretched to the break-

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ing point is what this is all about.

Or maybe it's not quite so illogical, after all. Maybe some superintelligent entity (like those who seriously postulate such things, I will sidestep the question of how such an entity came to be) did create the universe we know and love, and fine-tuned its physical constants just so something whose existence requires those constants would be able to exist.

But why assume that something is us? Maybe the delicate balance of constants was made the way it is so that sea slugs could exist—and we humans are just an incidental byproduct. Not flattering to us, if you consider us as superior to sea slugs as most humans do, but just as *logical* as the assumption that it's all for us.

Personally, trying to look at it logically, I see no need to make either of those assumptions, or any comparable one. Some have tried to avoid such things by invoking some version of the "many worlds" hypothesis, suggesting that our universe is just one of many that exist side by side in some "super-universe." Each, they say, has its own set of physical constants; we just happen to live in one of the few that makes our kinds of atoms and stars and planets and life possible.

This may be, but I see no need to go even that far. I find myself bemused by the strong compulsion some people seem to feel to go through such philosophical contortions to find deep significance in the fact that the universe is so constituted as to make us possible. It has to be constituted that way or we wouldn't be here to talk about it, but why should anyone assume that it was planned that way for the express purpose of *letting* us be here to talk about it? Why is it so difficult to accept the possibility that this is simply the way the universe is, and we are simply one of the very wide range of things it makes possible? If there's just one universe, it had to have *some* set of defining constants, and whatever ones you choose will define a set of possible consequences. Given that we got the ones we did, we're one of those consequences. I'm grateful for that, but feel no need to read more into it.

On a somewhat less grandiose level, I've said enough elsewhere about the logical lapses I see in arguments against evolution and for "intelligent design" that I'll just touch briefly on them here. In his *Analog* article cited above, Richard Meisner mentions a physicist named Heinz Pagels who "expresses bewilderment at the growing interest in the subject of cosmic fine-tuning," saying that future research will probably prove the finely tuned values of the constants to be natural consequences of deeper laws of physics than we have yet discovered. Meisner accepts that cheerfully enough, but objects that even if that's true, it leaves open the question of why the physical constants are just right to allow life as we know it. In Meisner's

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words, "Pagels's approach simply pushes the mystery back a step."

Well, yes—and so does the theological (or intelligent-design) argument that we and our world are so improbably complex that we must have been planned by something older and even more intelligent. That, if you persist in trying to be logical, begs the question: If you need a greater intelligence to explain us, what explains that greater intelligence?

Both physicists and theologians (along with everyone else) may just have to resign themselves to accepting that when you get down to a basic enough level, there are things they *can't* explain and must accept without proof, like the undefined terms and axioms on which mathematicians built geometry.

That's not so bad. Get used to it.

One more example of faulty reasoning in these matters recently occurred to me, which I don't think I've seen raised before. We're commonly told, both by religious fundamentalists pushing "creation science" and more-or-less real scientists pushing "intelligent design" that a designer is necessary because getting where we are by random changes would require too many such changes. This is pure handwaving, of course, and the first flaw (which I have seen mentioned, though less often than it might be) is that the people using it have no conception of just how much time has been available.

To give their argument any credibility, they would need a way to estimate quantitatively how many changes are involved and how often they can be expected to happen. Doing that, I suspect, would make it seem considerably less unbelievable than they claim. The planet has been here for a *long* time in terms of the reproductive cycle of humans (or just about anything else, with the arguable exception of a few trees like bristlecone pines and sequoias). But even if such a calculation seems not to refute the claim that "there hasn't been enough time," there's another mechanism at work that seldom seems to get considered—and it's a biggie.

The mechanism of evolution is a sort of parallel processing. You're probably acquainted with the concept from computer technology: An operation that would take prohibitively long if you had to do every step in sequence, one at a time, becomes doable if you can break it into several different operations that can

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be done concurrently by multiple computers, with their results brought together as needed toward the end. Evolution is like that. It doesn't depend on getting step *n* to happen here and step *n+1* to happen here later. Once step *n* is done, anywhere on the planet, zillions of copies of it are made. Any one of those copies can take step *n+1*, and once that happens, any of *those* copies can take the next step. Since there are lots of copies, different ones can even try a lot of *different* "next steps." So, in effect, the time available for evolutionary experimentation is many, many times longer than the reading on the clock. So many, in fact, that when you consider that fact, the claim that there hasn't been enough time for enough changes suddenly looks quite feeble.

That, admittedly, is a rather subtle argument, and not immediately obvious. So I'll make some allowance for people who simply haven't thought of it. But now that I've brought it up, they'll need a better response than handwaving to refute it. The fact remains that in questions of our place and importance in the universe, people tend to play fast and loose with logic. But if anybody really cares about the truth, they'll have to approach it with care, reason, and rigor. ■

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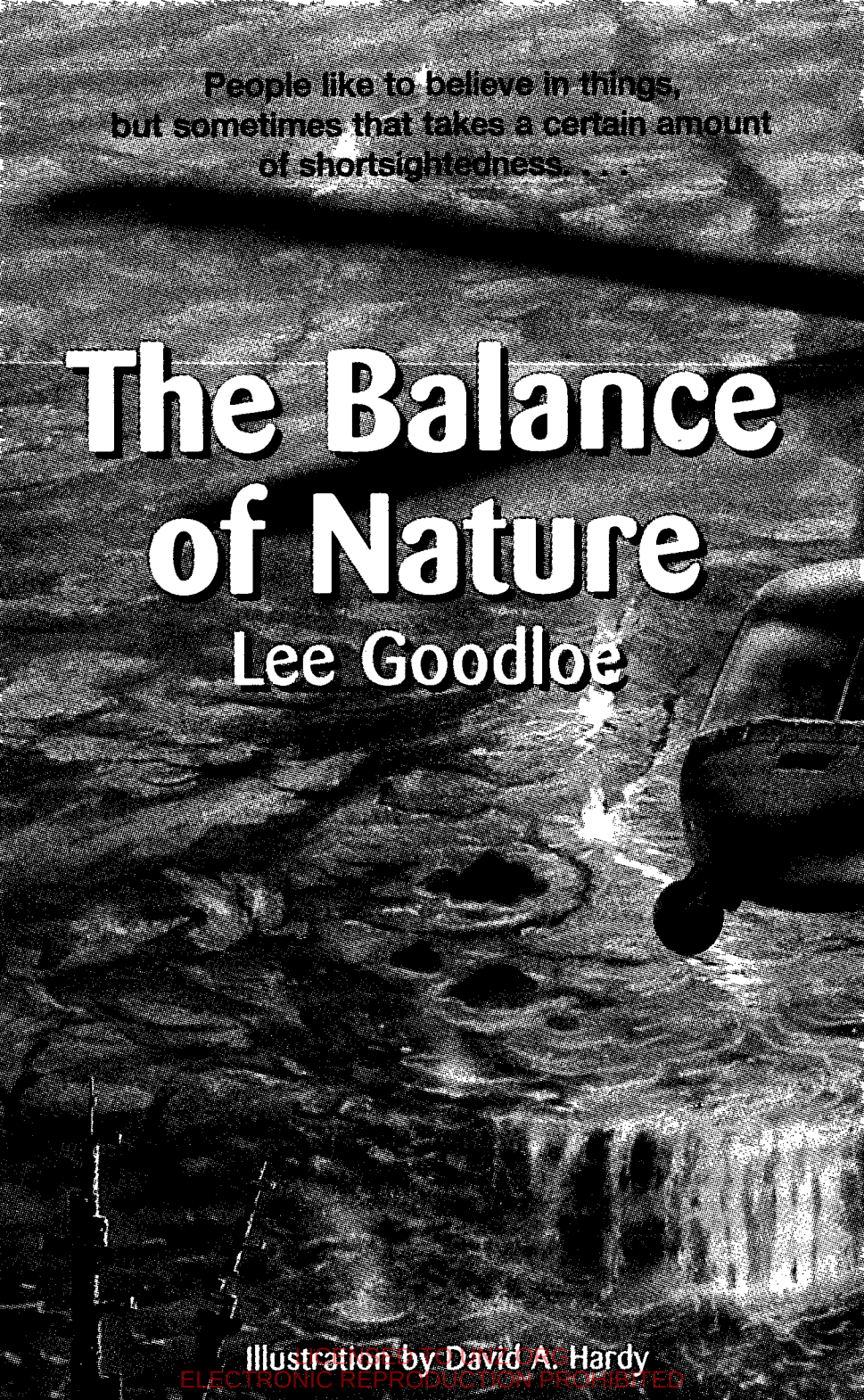
People like to believe in things,
but sometimes that takes a certain amount
of shortsightedness. . . .

The Balance of Nature

Lee Goodloe



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Deesa loved the view. From the upper dome of the Visitor Center, a bubble of glass bulging out over the 1200 meters of air below, she could look straight across to the towers of Leopolis. It seemed she looked right at the upper floor balconies, into the blackly iridescent windows behind, though they were a good 10 kilometers away. The tall dark towers rose like vast, stubby, branchless trees, growing improbably out of the green plain. They looked organic, in fact; but that, after all, was the point.

Or she could look opposite the city, toward the Everwinter Range. She turned her glasses in that direction. The distant mountains leaped into her field of view, their glacier-clad flanks sparkling in the midmorning sun, the rock of the carved crags dark in contrast.

And she was going there! This afternoon! Well, not to the mountains, exactly, but into the Preserve. They'd finally gotten the authorization for the seismic network, and she was going along—her first trip into the Backcountry. Ryke had finagled it for her. He'd said it would be a good trip for both of them.

Of course, maybe someday, in 20 years or so when *she* was a Senior Warden, she could go there any time. But for now, she had to content herself with the occasional foray as a member of an authorized expedition. A trace of wistfulness crossed her features momentarily. Sure, she *knew* the land couldn't tolerate hordes of people. If *everyone* could go into the Preserves, any time they wanted; well, they would hardly be Preserves, would they! But still .... What good was scenic country without someone to see it?

An incorrect thought, that! She'd better be careful to keep such opinions to herself if she even expected to keep her job at the Center, much less become a Warden. Otherwise her future excursions were liable to be confined to a park in Leopolis.

And Ryke would find someone else to take with him into the wilderness.

A nearly subliminal whoosh announced the 'lev. That would be the class due for today. At least she wouldn't have to give the whole spiel this time. Some seismologist, a—she touched the stylus to her keypad—a Dr. Wylan Zamer was also riding out with the kids. He was supposed to go on the expedition, but he also was supposed to talk to the children. Well . . . rephrase that. She *shouldn't* have to give the whole spiel this time, but sometimes these professors couldn't explain how to tie shoelaces, much less scientific concepts. Especially to children. She'd just have to see.

She heard childish voices and laughter, accompanied by the more moderated tones of adults. Then a gaggle of ebullient schoolchildren burst into the room, accompanied by a harried-looking middle-aged woman and a bearded man. *That must be Zamer*, Deesa thought. *He's a lot younger than I thought he would be.* The woman began, "Children, this is Wardmistress Nelfro. She and Dr. Zamer will tell you about the Center and about the Preserve." She paused uncertainly, and then added, "Dr. Zamer?"

Zamer looked at the kids. "I think Wardmistress Nelfro should give her introduction. She knows the Center much better than I do." He then turned toward Deesa and winked.

Well . . . indeed! That was not what she'd expected, either. Maybe he would be okay with the kids, after all. Gathering her suddenly scattered thoughts, Deesa launched into her standard greeting. "Welcome to the Visitor Center on the Great Scarp, the gate to the Everwinter Preserve. Here Nature has given us an utterly spectacular setting for showing us Her works. The Great Scarp is only one result of the marvelous geologic laboratory we have in our back yard. . . ."

The words were flowing easily now,

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but she'd done this *so* many times. *I should have it down by now*, she thought.

"We must treat this resource with respect and reverence. Take care of Nature, and She'll take care of you."

She ended with the rote slogan. There was a brief silence. "Um, any questions?" she asked. When there was no response, Deesa said, "Okay, I'll hand it over to Dr. Zamer, who'll tell you how the scarp got here. And lots of other interesting things."

Zamer didn't hesitate. "Okay, class, what *is* the scarp?" On hearing no reply, he continued, "It's a crack in the crust. What we call a fault. One side's moved up, and the other's moved down." He paused, grinning. "And we're on the side that's moved up." He waved out at the gulf below. The children looked too, somewhat nervously following his gesture.

"Now, when do the sides move?"

A child ventured doubtfully, "Earthquakes?"

"Yes! That's right. One earthquake at a time. Like an almost-stuck elevator, jerking its way up." A smattering of giggles followed his reply. After all, everyone lived in Leopolis's lofty towers.

"Anyone know what kind of rock the scarp is cut in?"

This time one child was definite. "Lava flows!"

Zamer grinned again, this time at the teacher. "Boy, you kids are smart!" He winked at the class while speaking. "That's just what they are. Stacks and stacks of lava flows, piled up like a layer cake. When you look at the Scarp from the front you can see the layers.

"These are really big lava flows, too, class." He paused for effect. "*Huge* lava flows. They cover *hundreds* of square kilometers, all in a few days." He paused again. "They reach all the way to Leopolis—far beyond Leopolis, in fact. If you dug down in the farmland on the other side of the City, you'd find these same flows." Again he waved toward the window, this time toward the distant towers.

"Dr. Zamer!" Another child's voice piped up. "Could an eruption like that happen again?"

Zamer's eyes twinkled. "Not only can it happen again, it's *going* to happen again." The children's eyes widened, and a couple of the more imaginative looked around nervously. "In fact . . ." he paused again for effect . . . "it's *guaranteed* to happen. Within the next hundred thousand years at the latest! In geologic time, that's the same as the day after tomorrow—or even this afternoon."

After the giggles of nervous relief had subsided, Zamer spoke again. "Look out to the north." He gestured, the class obediently looking where he pointed.

"See where the maglev comes up? What happened to the scarp there?" Perhaps a kilometer away, the cliff slumped down into great hummocks of broken rock, like frozen waves sprawling toward Leopolis. The maglev route exploited the break, the graceful curves of the thin silvery track glinting here and there as it snaked back and forth among the huge mounds of debris, winding its way up to the rim.

"It's broken," some child said slowly.

Zamer smiled broadly. "It sure is! What do you think happened?"

"The cliff fell down?"

"The cliff did indeed fall down. Very good." The child beamed. "The place where the maglev goes is a huge ancient landslide, the Great Slide. Thousands of years ago the whole scarp there just crumbled away.

"Any more questions? For me or Wardmistress Nelfro?"

After a pause a child raised her hand. "Wardmistress Nelfro! Why can't we go into the Preserve?"

Deesa found herself echoing the standard reply, as she'd done to herself earlier that morning, but trying to make it convincing.

"The land can't stand crowds of peo-

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ple. People don't have to be *everywhere*, all the time. That was the mistake they made on Old Earth. We don't want to make it again."

The child subsided, though she frowned dubiously.

"Dr. Zamer!" Another hand shot up. "Could a landslide like that happen again?" Again the most imaginative children looked around nervously, suddenly made aware of the precarious placement of the building they stood in.

Dr. Zamer grinned. "It's *certain*, class." He paused dramatically. "Just like another eruption. Within the next hundred thousand years or so." Then he winked at the class.

The kids giggled nervously again. They were interrupted by an unexpected jostling. Deesa felt as though someone had struck her behind her knees. She choked a shriek and spun around, only to lose her footing as the floor started dancing violently under her feet. She went sprawling, vaguely aware of glass splintering, falling around her like a burst of sharp hail. Automatically she brought her hands up to cover her head. The shaking seemed to last forever, but it couldn't have been more than a minute before it finally eased off.

Several children were crying, mostly from fear or surprise. A couple, though, were obviously injured. Deesa ran over to them, glass shards crunching under her boots. *First stop the bleeding* . . . She started through the motions automatically and competently, mentally blessing her training. This was the first time she'd had to use it for real, but her hands seemed to know what to do without conscious thought.

Deesa heard a shriek from the teacher. She looked up, and gasped. One of the children was hanging out of the broken dome. Wide, terrified eyes looked back at her as the child's hands, slippery with blood, scrabbled for a handhold among the glass shards, slowly sliding back all the while, suspended over the void below.

Deesa, horrified, felt frozen. Zamer, however, had also looked up at the teacher's cry. He immediately rushed over, grabbed the girl's forearms with both hands and heaved her back into the broken dome, stumbling as he threw himself backward. Zamer landed heavily on his back with an "oof!", the sobbing child thudding onto his chest as he instinctively curled himself forward, trying to keep from banging his head back onto the floor as he fell. Deesa felt like her knees had turned to mush, even as the teacher, echoing the child's frantic sobs, was reaching over to pull her away and hug her. Zamer, left supine on the floor, reached his hands back to push himself up to a sitting position, heedless of the broken glass covering the floor. He simply sat there, rubbing his lower back ruefully, seeming not to notice the blood now streaming from his hands. Then Deesa, finally freed from her temporary paralysis, ran over to help him to his feet—and to attend to his cuts.

After helping bundle the kids and their teacher—and the infirmary nurse who was going with them—back into the 'lev, Deesa came back in to the dome and looked at the mess. She shook her head. At least the maglev track hadn't been broken. Although the earthquakes had been coming more frequently now, this was by far the strongest. She shook her head again, vaguely uneasy, and continued on to her office.

Zamer had borrowed the webster in her office and was querying the seismic center, his finger movements awkward from the bandages on his hands. She came over to watch.

"About a magnitude 6.5," he said, answering her unspoken question.

"It had to be big, to break that glass! That's not supposed to happen." She shuddered again, remember the child who'd almost fallen.

"And it's close." Zamer had punched

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some commands into the qwerty and a seismogram trace appeared on the display. Deesa looked over his shoulder. "Look at that S wave arrival. Only a couple seconds behind the P wave." He pointed to a pair of squiggles.

"Do you have a location?"

He keyed in more commands, then grimaced. "Not really. All we can say is the epicenter's to the north, maybe 20 kilometers or so. And it's shallow, but I can't get a handle on the depth." He turned and looked at her with a wry grin. "That's the point of the expedition, after all. We need to set up a denser seismic net if we want to pinpoint these things."

Deesa hesitated, wondering how to phrase what she wanted to say next. "Um," she began. "That was . . . that was brave how you grabbed that girl who was about to fall."

He looked up, seemingly a bit embarrassed, and shrugged slightly. "It's what anyone would have done. I just happened to be closest."

"Well, lots of people couldn't have done it. I felt like my feet were nailed to the floor." She found she was leaning over more closely than she'd intended, and drew back abruptly on hearing someone behind her. She turned quickly.

"Oh, Ryke!" Deesa said awkwardly. "This is Dr. Zamer. He's the seismologist that's coming with us into the Backcountry. He's setting up the seismometer network."

"Call me Wylan," Zamer said. Ryke began to offer his hand, and then paused, seeing the bandages. "It's okay," Zamer continued. "Just a couple scratches." They shook hands, eyeing each other. "I'm Ryke. Ryke Telow," Ryke said. There was silence for a moment.

"Wylan rescued a little girl," Deesa injected into the silence. "She almost fell out of the dome, but he grabbed her."

Zamer looked embarrassed again. "Oh, it was nothing."

"Doubly glad you're here, then," Ryke said after a short pause. "The permitting went slowly, but it looks like we're heading out this afternoon. So your trip out won't be wasted."

"Maybe we should have headed out sooner," Deesa interjected uneasily. She still felt unaccountably concerned. Apparently the morning's quake had shaken her more than just physically.

Zamer laughed. "It's okay, Deesa. We're moving on geologic time, here. A day or two won't matter."

Ryke picked up the thread of his thought. "So some aquariums got sloshed in the City." He waved his hand impatiently. "No big deal. The buildings can take it easily."

Wylan agreed, "This is just a scientific question. We don't need to cut corners."

Ryke followed with, "Besides, the Primitivist needs to get in place, anyway. Until he flags where the sites will be, we can't do anything."

Primitivist. A member of the organization that took Leopolis's philosophy to the extreme. Primitivists rejected all mechanization, even nanotechnology when they could. Most claimed they'd go back to being hunter-gatherers irrespective of the costs. They refused to ride a conveyance, even to save their lives . . . though that wasn't often put to the test. By law, a Senior Warden had to supervise any expedition into the Preserve; and Primitivists were disproportionately represented among Wardens—especially Senior Wardens.

Deesa subsided, still uneasy but saying nothing, intimidated by the men's dismissive attitude. Ryke looked at his watch. "Well, it's about time for the ATV training session, anyway. Let's wander over there. I need to get ready in any case."

Deesa looked at the ungainly contraption on the ground in front of her. Four ridiculously fat, knobby tires at the corners of a frame splayed out like a squashed bug; a wide (and uncomfort-

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able-looking) bicycle saddle perched in the middle; a set of handlebars mounted above a bewildering array of switches, knobs, and dials . . . she'd seen an ATV before, of course, but never up close. They were only permitted for specialized purposes, and there weren't many of them.

And now she was expected to learn to *ride* this thing! This afternoon. Before they headed out.

At least she had company. Most of the rest of the expedition had never been on an individual, powered vehicle before. She saw Zamer, too, on the other side of the semicircle around Ryke.

"Okay, everyone! Mount your machine! Sit astride in the middle and grab the handlebars. It's just like a fat bicycle." He did so himself, demonstrating on the ATV in the middle. "Now, before you do *anything* else, make sure your helmet's on and it's fastened." He buckled his with a flourish.

She straddled her machine uncertainly. It was much too wide, and it sat down way too low, too. Even when she grabbed the handlebars it felt nothing like a bicycle. And she also wondered how to control it. A bike felt like part of your body. You definitely felt like a passenger on this thing, a superfluous ornament stuck on top.

Ryke was speaking again. "This ATV is a real simple machine. There's no heads-up display or anything like that—just hardwired gages and switches." He indicated a conspicuous rocker on the front panel. "Here's the main power switch." You've got a fuel gage to the left of it. The other gages show voltage and current. You've also got warning lights for each wheel motor, if it overheats or gets stuck or something. These lights . . ." he gestured again . . ." indicate the status of the fuel cells." He continued on with his descriptions, Deesa trying to pay attention. With all the details, though, it was like trying to drink from a fire hose. She figured that if a mysterious light did come on she'd simply ask him.

"Don't touch this." Ryke finally indicated a big rocker switch under the handlebars. "That engages the rear steering too. You can turn a lot tighter, but it's a *lot* easier to flip."

"Okay, everyone. Got that?" There was no answer. Deesa thought with guilty glee that everyone else looked as dazed as she felt. Even Zamer looked uncertain. His technical expertise evidently didn't translate over to the operation of wheeled vehicles.

Ryke waited a moment more, and then said, "Great! Let's practice. It always makes a lot more sense when you do it. Go ahead and start your engines."

Deesa obediently flipped the rocker switch. Some panel lights came on, and she heard a faint whine. "Now try going forward," Ryke said.

Her sense of insecurity heightened a hundredfold when she experimentally twisted the power rheostat—called the "throttle," for some incomprehensible reason—under her right hand. The vehicle jerked forward sharply, practically throwing her off backward. She twisted the control back hastily, and then almost flew over the handlebars instead as the machine halted. Her fingers tightened on them till her knuckles stood out whitely.

"Easy!" Ryke shouted. "Gently! Make smooth movements." He demonstrated with his machine, rolling it forward gently and then backward.

She tried again, gingerly twisting the "throttle." Out of the corner of her eye she saw her companions doing the same. Evidently everyone else had managed not to fall off, too.

She still felt like she was an ornament stuck precariously atop an awkward lump of metal. An awkward, *willful* lump of metal.

"Now try steering, to the left. *Gently*." Cautiously she turned the handlebars. The machine turned obediently. They went through some simple maneuvers like that for a few minutes.

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"Okay," Ryke said. "Now the whole point of these machines is that they don't need a smooth road. Head for those rocks." He gestured down the slope in front of them toward a group of low boulders.

On arriving at the boulders, he said, "Okay, when you're going up over rocks like this, lean into the slope. Use your weight. Don't lean back because that pulls you off. Let the tires find their way. Don't fight the machine, just guide it. Let it be part of you."

Yeah, right, Deesa thought to herself. But she didn't say anything.

"Also, it's very important when you're turning to lean *into* the turn. High-side, we call it. Centrifugal force makes you want to lean out. And that's how people crash. You're all carrying equipment we need. So don't crash." He grinned again.

Still grimly hanging onto the handlebars, she tried to lean forward, tried to lean into the turns, tried to make the machine "part of her" as Ryke made them practice what he preached.

She hoped the practice was helping. It sure didn't feel like it.

"Now, listen up!" Ryke waited till he had everyone's attention, then continued. "Everyone follows *exactly* the path of the vehicle in front of them. We are minimizing damage to the land. That means we stay in main drainages and on marked trails. No cross-country travel. At all. Except in dire emergency." He looked over the small group again. "Any questions?"

"What's a dire emergency?"

"If you have to ask, it isn't." He softened the reply with a grin. "Anything else?" There was silence. "Okay, let's head out. Mount and start engines."

They headed northwest away from the Center, toward Slide Gap, where Slide Creek dropped steeply through a narrow canyon that cut across the first ridge parallel to the Great Scarp. The trail was easy at first. It went downhill, but not very steeply, and was wide, well-defined, and fairly smooth. At one point, though, Deesa caught a front wheel against a rock. The jolt nearly jerked the handlebars out of her hands, and she saw what Ryke had meant about keeping a firm grip. She'd probably have a bruise between her thumb and forefinger, too.

After a kilometer or so they reached the Gap. There large black basalt boulders, washed down and polished by innumerable floods, lay separated by stretches of dark sand and gravel. In spring the boulders would have been embraced by raging whitewater, but this late in the summer, the creek had dwindled to a set of trickles and disconnected pools. Everyone ahead of her was waiting at the creek. Deesa stopped too, this time with only minimal tendency to sail headfirst over her handlebars. In a few minutes the rest of the party caught up, including Zamer. He pulled up beside her and switched off. He smiled at her, but it seemed a bit strained. He'd obviously had no more experience riding an ATV than she.

Ryke was standing beside the lead ATV. He began, "Okay, hope you practiced on the way down, 'cause now it gets slower and harder." He grinned. "From here, we'll go up the drainage through the gap. It's not only the least damaging way, it's the only way. The ridge here is too steep to cross without building a trail . . . and we won't do that!

"So. You'll have to thread your way through the boulders. Watch your speed. And your balance." With that he winked at Deesa.

He switched on his ATV and started up the watercourse. Deesa got in line behind. It *was* slow going: little flat stretches went quickly, the black gravel crunching under her wheels; but then came steep sections of boulders where she had to ease up, remembering to high-side, to lean toward the side that was tilted up while the big fat tires scrabbled for a purchase on the smooth rock. *We could* walk *this fast*, she

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thought. But she was enjoying it. It was cooler in the canyon, and even though her helmet was made of buckytube composites weighing barely a few grams, her scalp had already gotten itchy with sweat. The shade helped a lot. She liked having a chance to look to either side, too, at the black ledges above her with vegetation improbably perched in cracks and crannies. There was also a *lot* less dust, she noted, when you were going slowly.

At length the canyon flattened out and the drainage widened. They came almost to a T-junction where the main drainage veered abruptly left while a big side wash came in from the right. They turned left to follow the main drainage. Its grade became more shallow, with much longer stretches of smooth black gravel only occasionally interrupted by rocky bars or banks where Deesa had to slow down. Six or eight kilometers passed in a reverie, as her hands and eyes guided the ATV seemingly without conscious thought. Maybe she *was* getting the hang of it . . . part of her mind was surprised at herself.

She was jarred back to reality, though, when she almost rammed the machine ahead of hers. The expedition had slowed abruptly again as the main drainage swung sharply to the right, while a side drainage went straight ahead shallowly uphill. The main drainage now crossed the ridge to the northwest through another gap. Although it wasn't as abrupt nor as tall as Slide Gap, they again had to slow down to ease through another boulder-choked canyon.

Another T-junction awaited them, with the main drainage now abruptly bending right. A gaunt figure waited there silently. Ryke, in the lead, pulled up by him and stopped. "Warden Drafer?" he asked, as he climbed off the ATV. The figure nodded briefly, ignoring Ryke's outstretched hand.

"Which of you is Zamer?" Drafer asked without preamble, scowling. Zamer walked up, also proffering his right hand. Drafer just looked at his bandaged hand. "Injured yourself, eh? Serves you right for coming out here in the first place. You don't take care of Nature . . . well, Nature won't take care of you."

Zamer obviously was choking back a tart reply. He succeeded in merely responding mildly, "Where are we to go?"

Drafer pointed up the side drainage. "Follow the drainage up. I've flagged where the *seismometer*"—he spat the word out—"is to be installed. Remove the flagging when you return." He glared at them again. "And make sure you only drive those damned machines where you're supposed to! I will meet you at the camp site."

He turned and started up the main drainage. Seeing Deesa, he stopped directly in front of her. "Ward*mistress* Nelfro," he said. Deesa almost gagged at the overpowering reek of unwashed body, but she tried not to show her distaste. Many Senior Wardens were particularly sensitive about their odor. It was *natural*, after all—and rejecting what was natural obviously cast doubt on your fitness to be a guardian of Nature's wonders, as represented in the Preserve. Jarvas Drafer was an important Warden. It wouldn't do to get crosswise with him.

"Yes, Wardmaster," she managed to say.

"You are responsible to make sure that there is *no unauthorized damage* to the land!"

Deesa gulped. "Yes, Wardmaster. Goddess bless."

"Goddess bless." He turned again and stalked off.

Every muscle ached, even muscles she hadn't known she had. Deesa painfully and stiffly climbed off the ATV, doing her best to move as little as possible. How was it possible to be so sore when the *machine* was doing all the work? Sure, she'd ridden bicycles, sometimes for tens of kilometers, but you *expected* to be sore and fatigued then. Af-

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ter all, your muscles were powering the bike. Here, though, all she'd done was hang on.

She parked the ATV as she'd been shown—wheels braked, power off, steering locked—and then had a sudden thought. She dug out the pad for her sleeping bag from the equipment stashed on the back. Sitting on the ground—especially when it probably involved lying back against rocks—seemed particularly unattractive right now. Clutching her cushion, she then staggered over to the campfire. A part of her mind noted that most of the party seemed to be as sore as she was. Only Ryke and a handful of the senior people seemed to be moving perfectly freely.

"How ya doin', pilgrim!"

"Not so well," she choked out, trying to be civil. She found Ryke's cheerfulness jarring.

"Here," he presented a pill with a flourish. "An anti-inflammatory. Shuts down all the complaining muscles."

That was better than cheerful words. She gulped the pill.

Wylan walked up too. "Ryke, could I get one of those?"

"Sure." Ryke dug out another pill.

For all that he'd wanted an anti-inflammatory, too, Wylan seemed incomprehensibly cheerful. Deesa soon found out why.

"We'll actually get some new data, now. Get a handle on where the quakes are located." Wylan said.

"Of course, the ridges-and-gaps topography is a pain," he continued conversationally. "We could've been here hours ago." The silence lengthened briefly, and then Ryke said, "Okay, I'll ask."

"The ridges are where the surface layers have buckled over faults underneath. And those faults are all parallel to the Great Scarp. But the overall slope of the land is toward the Great Scarp. So the grain of the land lies at right angles to the ridges."

Deesa shifted around atop her pad, half listening. It *did* feel good just to lie back in the cushion.

"That's why we're having to zigzag. The drainages don't cut straight across the ridges. They run between them, and just cut across once in a while. Those are those little canyons we came through, what we call water gaps."

Ryke evidently was paying more attention than she was. "So, are these parallel faults the problem?"

"I think one—or maybe more—of them is where the earthquakes we've been having are happening, yes. But I can't tell *which*—if any—because our locations have been so poor."

"What would it mean if the quakes have all been along one fault?"

"Dunno, really. That's part of why we're here. Maybe the activity has shifted off the Great Scarp itself. Maybe something else is happening. But now maybe we'll *know*."

Obviously Ryke was finding Zamer's enthusiasm more infectious than she was. As were some of the others who'd wandered up: Zamer was now lecturing delightedly, the center of interested attention. For her, though, the buzz of conversation was becoming background noise—an almost soothing hum. Soon, despite her soreness—and despite missing dinner—she fell into an exhausted sleep atop her pad.

Even the earthquake later that night didn't wake her up.

Morning dawned bright and much too early. Deesa blinked drowsily. She lay underneath a tree, vaguely noting the radial pattern of the branches, sticking out stiffly from the trunk.

"Deesa!"

She finally awoke. Ryke stood there with a cup of something hot. "Rise and shine! Lots to do today."

She accepted the cup gratefully, noted as she sat up that Ryke's pill seemed to have done its job.

"Just leave your stuff. This'll be our base camp for a couple days. Then we'll

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move to a new camp closer to the mountains."

Zamer had drifted up, quietly nursing a cup of his own.

"Why so quiet, Wylan?" Deesa asked. I though *I* wasn't a morning person!"

Ryke said, joshingly, "Wylan was up half the night looking at his new data. No wonder he's quiet now."

Zamer replied, with a flash of irritation, "You may be very happy I was looking at data. *Somebody* needs to be looking at it. Soon."

Taken aback at Zamer's vehemence, Deesa and Ryke looked at each other. "What's wrong?"

"I think I may have been very wrong, that's what. It doesn't look like we're going to have to wait a hundred thousand years."

"What do you mean?" they said together.

"We didn't have the net coverage to tell—we *still* don't—but it looks like some of those quakes might be harmonic tremors. And if they are, it probably means we've got a body of magma floating up through the crust below us. Like a bubble in a beer."

That image struck Deesa forcefully.

"And we've still got to wait for Drafer to go set his little flags. As though it would make any damn difference." Zamer tossed off the rest of his cup and shook out the remaining drops. "Let's get going. Maybe I'm wrong again."

Another small earthquake shook the camp while they were packing the equipment to leave. They hardly noticed.

By afternoon they found themselves working their way up a side wash, a narrow clough between steep ridges, following a trail of bright flagging tape. This was the fifth?—sixth?—installation they'd done today. Deesa'd lost track. The day had turned into a blur of driving, unloading, hooking up, testing . . . it was surprising how quickly the novelty had worn off. *Anything can become just a job*, she supposed. What she found most disturbing, though, was Zamer's taciturnity. After that outburst this morning he'd hardly said a word, other than the brief instructions necessary to get the seismometers emplaced and running. His morose mood was contagious.

Drafer was here. He'd set out early, on foot, to mark the locations, and they'd finally caught up to him. As was his wont, he barely acknowledged their existence as the ATVs drove up. They parked at the place where he'd flagged for them to do so. Deesa pulled up, and in a set of moves that had become surprisingly habitual, shut off the motor, fixed the wheels, and began to get off.

"You. Girl! *What* are you doing!" Startled, Deesa paused in the very act of dismounting her machine. Drafer stalked toward her, stopped directly in front of her, the rank stench of his unwashed body thick in her nostrils. *He's doing that deliberately*, she realized. *He's trying to make me recoil as he invades my space. It's a power game.*

"Wha . . . what?" she asked. In answer he pointed to her ATV. A few green shoots poked from beneath the right front tire.

"You don't just drive over a bush. You should be setting an example!"

Deesa fumbled for a reply, "But you *said* it was okay! There's your marker."

"Those are just guides, subject to a little common sense from the people following them. You're supposed to be a *Warden*. You should be especially careful!

"I'm going to file this. That's the problem with female wardens. They don't care about Nature. They see Her as a competitor."

Deesa was taken aback so completely she didn't know what to say. Shock and anger were tempered by caution, a recognition that Drafer could easily destroy her career. She tried to frame a reply, "But . . ."

Zamer had been listening, obviously impatient to get the installation done.

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But when he spoke it caught them both by surprise.

"You old *fool!*" Drafer turned at the interruption, thunderstruck. No one talked to a Senior Warden like that. But not only had Zamer spoken like that, he continued without a pause. "This whole business could blow up at any moment and you're carrying on about a single *bush*. Let's get this done and let's get *out* of here." He turned abruptly and went back to his ATV, undoing the lashings on the stowed equipment with unnecessary violence.

As if to punctuate, another little tremor spilled some boulders down off the ridge above them. They crashed down through the brush, eventually coming to rest not 10 meters away.

Zamer looked up briefly. "Oh, and tell *Nature* not to smash the bushes, while you're at it."

Drafer looked as though he would say something, but surprisingly held his tongue.

Camp that night was even more subdued. Drafer, of course, still shunned the others' company—to their relief—but Deesa was still upset by Drafer's reaction, and even more by Zamer's obvious concern. Even Ryke was quiet. The evening's dinner wasn't marked by the cheerful banter that yesterday's had been.

By tacit consent they turned in early. Although Deesa had thought she'd lie awake worrying, her exhaustion took care of that.

Something woke her up. It was still dark out, but she felt the shaking. *Just another quake?* she thought. She lit up her watch dial: 3:45 AM. *Why did this one wake me?*

The shaking actually seemed milder than most. But there was something else, a nearly subliminal rumbling that persisted and grew even after the gross movement died away. Something about it made the hair on her neck rise; she found herself shaking herself out of her bedroll, tying her hair back, pulling on her boots, striking her gear, in readiness to flee—what?

That soon was answered. An ongoing set of explosions shattered the night, off toward the low ridge behind their camp. They were followed by crashings, crunchings, the noises of heavy objects smashing through brush. Not far away she heard a tree splinter, the noise doubly unnerving because in the darkness she couldn't tell exactly where it was. Someone screamed—whether from fright or injury, Deesa couldn't tell.

Soon the explosions were replaced by a roar like an unmuffled jet, and Deesa thought she could see, in the darkness to the northwest, a faint orange glow. It at first flickered on the edge of visibility, but strengthened—and then there was no doubt. A jet of orange fire rose toward the sky. No, several jets. . . . multiple jets! The whole ridge north of their camp was being outlined by flaming fountains, twisting jerkily, but rising.

Recognizing the phenomenon erased some of the primordial terror, but at the cost of replacing it with real fear. Even as the fire fountains leaped higher in the air, they spread a lurid orange spray of molten drops, which faded to black as the drops cooled during their flight. She heard an occasional pitter-pitter, like hail, but—fortunately—most of the hot cinders didn't seem to get thrown as far as the debris from the initial explosions. Up toward the ridge, though, yellow flames now blossomed here and there. They oozed from away from the fountains, where still-hot cinders had set the sparse forest on fire.

Those flames in turn paled against a brightening along the ridge itself. The very ground had split, to yield yellow-hot fluid lava that spilled out and began flowing downhill. Its advance was hesitant, as it encountered obstacles and its own chilled flow front, which cracked and broke with the ongoing movement. But it was urged on remorselessly by the pressure of the swelling mass behind,

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and it was coming directly toward them, toward their camp set up in the lowest part of the drainage.

She shook herself. It was an awesome sight, but it wasn't one to be watching from here. Abandoning the bedroll and her gear, Deesa ran to find where she'd parked her ATV. A pair of bright lights, accompanied by the whine of an ATV's motors, approached her, bouncing erratically. She blinked into the lights even as the other machine's whine cut off abruptly as its operator braked. "Deesa!" Ryke's voice came from behind the dazzling glare. "Thank the Goddess, you're okay. Follow me! Let's get out of here."

He waited for her to nod, and then roared off down the wash, the beams from the lights on the front of his ATV jittering crazily across the landscape. But wait a minute . . . where *were* those lights?—"headlights," Ryke had called them. That was another detail she hadn't figured she'd need in the briefing. After all, they hadn't been planning to travel at night. She fumbled in the gloom, her eyes still dazzled, trying to remember which switch it was. Several panel displays flickered and died while she poked switches randomly. There! A pair of brilliant beams flashed on. She blinked again in the sudden light.

She was startled by a muscular grip pulling back on her left shoulder and an all-too-familiar animal reek. "Off, girl! You're no Warden anyway. You stay here and atone for your sins against Nature." Drafer's growling voice held a quaver she hadn't heard before. Automatically she resisted, twisting around in his hold. But as she did so she caught a glimpse of something metal in his right hand, glinting in the backscattered light from the headlights.

"You won't burn. I'll be quick," he said, the hysterical undercurrent in his voice breaking through. She screamed then, an uninhibited full-throated scream that was nonetheless lost against the background din. But she also jabbed back sharply, desperately with her left elbow. She heard Drafer grunt and felt his grip relax; then she grabbed back onto the left handlebar again and twisted the throttle with her right hand. The machine reared up on its rear wheels and she felt Drafer go sliding back. Then the tires found their grip and the ATV lurched forward. Something caught Drafer and she felt his grasp vanish. She backed off the throttle—suddenly she was bouncing wildly, going much too fast over the rough terrain. She dared a glance back.

Drafer was getting on his feet again, the knife in his hand. She was glad she couldn't see his face. Although he must have had the wind knocked out in his fall, he was clearly starting to run after her; heavily and clumsily, but that would change as he got his breath back.

He's trying to take the ATV, she realized. *Take it and leave me here, leave me with my throat cut.* Deesa choked another shriek and pointed the ATV up the hill. Problem was, she realized, even though she was now leaving the low ground she was still angled toward the eruption, and somehow she'd have to get turned around. And in broken country the ATV's speed wasn't much of an improvement over a running man's.

Well. She *had* to get away from Drafer. He had the knife, and she had no doubt that he was a lot stronger than she. Her only advantage now was the vehicle she was riding. That, and the fact that he obviously didn't take her seriously.

She pointed the vehicle at a relatively smoothish space ahead and gunned it again. If she could get far enough ahead, he couldn't use the backscattered illumination from her headlights to see where he was going. That would slow him down a lot. And then she could worry about bringing her heading around so that she was pointed *away* from the lava.

A branch *thwacked* the low windshield and bounced up into her helmet, bringing tears to her eyes. Damn. She'd

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have to watch out for obstacles other than those on the surface. And she'd have to make sure to stay out of the thickets in this patchy forest. No point in getting trapped by a forest fire instead of molten basalt. Double damn.

Deesa came out of the holt and saw the skyline of the ridge ahead limned by orange. Patches of yellow flame spoke of burning woods. Even as she watched, a distant tree exploded into a torch. The eruption clearly had broken out along the ridge crest (Wylan could no doubt have told her why). At least the fire fountains had subsided; the rain of hot rocks from the air had abated, at the cost of being replaced by the swelling eruption of molten basalt.

She was going to have to work to the right, then. The eruption was on the ridge to the west of their camp, so she had to go away from it, toward the eastern ridge. And then try to get down into the drainage between the ridges to follow the others out.

Unfortunately, Drafer could figure all this out, too. Suppose he just watched her lights and came across to intercept her once she'd turned back? Put more space between them, then, and parallel the advancing lava front as near as she dared. Make him come after her. He couldn't know how far she'd stay with the lava front, and he wouldn't dare wait where he was, in the lowest ground.

She angled toward the advancing flow front and gunned the throttle again. At least there wasn't any forest in this direction. As she approached, she could see the glow brighten ahead. The flow wasn't constant, like a water flood, she saw. At the advancing edge the bright orange liquid would cool and crust over, growing duller; then the pressure behind would break through with a surge of new fluid lava and the whole process would start all over again. The result was a jagged flow front, a ragged line of lobes—some cooler, some hotter—thrust out in front of the main mass. That could be a problem, she realized; you wouldn't want to find yourself stuck between two advancing lobes.

The heat was intense even from here. She turned parallel to the front, trying to stay a constant distance ahead as it advanced, watching for any surges that might suddenly run forward unusually far. *Like surf at the beach*, she thought—but if you misjudged how far surf would run up, you just got wet. The consequences here would be a lot more serious.

"Aaak!" Deesa gasped, drawing her breath in. She found herself overlooking a draw—a draw already running full of fluid basalt, well in advance of the main front. She felt a new layer of sweat break out as the furnacelike heat washed over her in waves. She *had* to turn here; she had no way to cross a lava river.

And now she *knew* Drafer would be down there waiting for her. He knew this country, after all, and would have known about this draw, had realized that the lava would flow down it first, and had figured that it would cut her off and drive her back toward him.

Well. She had the ATV, and she would use it. He might be stronger, but he wasn't stronger than the machine. The lights, too, she realized . . . they might be beacons showing her location, but they would also be blinding for someone facing them. Face him, then. Drive directly toward him. Run him down! He would be expecting her to slow down, to dodge, and she wouldn't. And she would need to be able to maneuver quickly . . . she flicked the big rocker switch that engaged the rear steering.

Deesa was paralleling the draw, senses alert, realizing that he would know exactly where she was long before she saw him. She kept as close as she dared to the lava channel on her left, figuring that way she'd only need to watch her right. And she would cross the draw as soon as she got in front of the lava.

Almost to the end of the lava . . . it

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was stalled for the moment, jammed behind a pile of cooled crust and entrained boulders. He's going to be here, somewhere . . . she saw a flicker out of the corner of her eye and turned directly toward it. Drafer stood there, the knife glittering, teeth bared in a grimace, eyes wild in the headlights. Deesa accelerated directly toward him. For a second he seemed transfixed, but at the last second he tried to dance out of the way on her left, slashing at her with the knife. She swerved toward him and felt a sharp pain along her left arm at the same time as a tremendous thud on that side. She bounced up; then she was by, rolling down into the ravine, taking advantage of the smoother path there to gain some distance.

She had no idea how badly Drafer was injured and didn't want to find out. A creaking noise behind her, though, drew her attention, and she dared a glance behind.

The lava jam was breaking up, the jumble beginning to disintegrate as new lava pushed from behind. Even as she watched, bright hot orange tendrils spurted out and the entire pile collapsed. Now a wave of lava at least five meters tall surged forward, its crest jagged with cooled crust and swept-up boulders. Drafer was silhouetted in front of it, standing in the draw behind her.

Badly frightened, she gunned the ATV and turned it sharply to the left to get up out of the draw. Too sharply: the ATV tried to flip over, teetering on its two right wheels on the outside of the curve. In stark terror she high-sided, throwing her weight as far to the left as she possibly could, feeling sick relief as the ATV slowly settled back onto its left side. The wheels then scrabbled up the other side of the ravine, and she was out.

There was one horrible scream behind her, then nothing but the hissing and crackling of the lava. Newly ignited bushes added stinging woodsmoke to the air, but the vegetation cover right here was still thin and patchy. At least fire was not an immediate danger.

Deesa continued climbing, quartering away, putting more distance between herself and the lava. She figured she was supposed to spare a thought for Drafer's horrible fate, but she couldn't make herself care. She was just relieved that now he couldn't possibly attack her again. She spared a glance back to the south, along the little drainage she'd just crossed. That draw obviously had to join the main drainage they'd come up, and it too was now running hot fluid lava. Even if she could get ahead of the lava to take the path back the others had taken, there was no guarantee she could *stay* ahead. She'd have to slow down, slow down a *lot*, to go through the water gap where the drainage crossed the ridge she was now on. But the lava wouldn't need to slow down to pick its way through the boulders.

The thing to do, then, was shortcut across this ridge, pick up the main drainage again on the other side. It occurred to her that that meant she was going cross-country. She grinned to herself, half wistfully, half hysterically, *Well, Ryke, I think it's a dire emergency!*

But it was one thing to say what needed to be done, quite another to do it. This country was a lot rougher than the relatively smooth ground along the drainage, and she had to pick her way carefully. It was hard to see, too. The bouncing beams of the headlights starkly exaggerated bumps, ruts, all the relief ahead. The black pool of shadow behind a rock might conceal nothing, or it might hide a hole deep enough to trap a tire.

The wind was also coming up, blowing into her face, sand stinging her eyes. Hot air was rising above the lava, she realized, and cooler air was blowing in to replace it. Its relative coolness was a relief, but it tended to blind her. She brushed some strands out of her eyes, and caught briefly the stench of singed hair.

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At length Deesa topped out on the ridge crest. At least it was lower and flatter than some of the ridges they'd seen on their expedition. It was amply high enough, though, to give a view back whence she'd come. The scene behind could have come from any of a multitude of versions of Hell. The entire sky in that direction was lit up by an eerie orange glow, and from her vantage point she could see intricate anastamosing channels and pools of hot lava, ranging from bright orange to dull red, with even some fire fountains still spraying way off to the south. Flecks of yellow in the dwindling dark areas between the hot lava—the higher ground—indicated burning vegetation. And the tableau was not static but seething with activity, the bright patterns on the lava surface shifting even as she watched.

It would have been awesome, even beautiful, if it hadn't been so close. And so deadly. Deesa headed down the other side of the ridge, and then stopped again when she'd gone far enough to see all the way into the shallow valley beneath. A brushfire burned on the slope below her, no doubt a spot fire from some errant cinder earlier. But it blocked the direct way down. To avoid it she would have to quarter back to the right—so that she would intercept the main drainage farther upstream, nearer the approaching lava.

And the going became very slow again, as the slope steepened and she once again had to pick her away among rocks and bushes. She could *walk* faster than this! She was crying with frustration, but she didn't dare abandon the machine since she knew she couldn't run the whole rest of the way once she got down. Deesa couldn't resist, however, glancing often upstream. The oncoming basalt would be slowed down at the bottleneck of the water gap where the drainage crossed the ridge. It would be slowed down even more there because its own cooling tended to block its further advance.

But would it be slowed down enough? She didn't see that ominous orange glow off to the right. Yet. She tried to force her pace downhill as much as she could. But there were limits.

Her big terror was that the basalt would break through before she even got down. She would be trapped on this ridge, looking down at an impassable orange river, and with no place else to go. Die of thirst, or burn to death? It was not an attractive choice . . .

At last. The main drainage. It almost looked like a street by comparison, wide and reasonably smooth—but remember the bars and channels we crossed coming up, she reminded herself. It wouldn't do to get overconfident on this stretch. The eastern sky was getting gray now, too. That should help the visibility. Trying to drive fast, even on this relatively smooth section, by just the bouncing, jittering headlights invited disaster. She could also use their tracks up from two days ago as a guide.

But Deesa was altogether too conscious of an orange glow now visible upstream. Obviously, in inexorably finding its way downhill, the lava had finally worked its way through the water gap. It was several kilometers away, still, but it would be moving faster beyond that choke point. At least she was also finally moving faster, even faster than she could walk. But was that going to be fast enough? She'd have to slow way down again to exit through Slide Gap—and Ryke had made a point of saying there was no way around.

It was hard not to throw caution to the winds, to go as fast as the machine possibly could. But she would have to restrain herself—if she wrecked her transportation she definitely was done for.

A part of her noticed that she wasn't even conscious of guiding the ATV any more. It *was* part of her body; she wasn't just *riding* it, she was *wearing* it. Ryke was right, there, too; she'd be-

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come one with the machine.

Deesa just wished learning to do so hadn't been quite so intense.

Finally, after kilometers, the main channel turned to the right, into Slide Gap. The glow behind didn't seem to have gained on her—but then, she hadn't left it any farther *behind*, either. And now, dropping into the Gap, the channel promptly became steeper and choked with tumbled boulders. Again she had to slow down drastically, pick her way along at barely more than a walking pace, just as they'd done on the way up; but now knowing that a river of molten basalt was approaching from behind to flow down this very same channel. And again she knew that the *lava* wouldn't need to slow down to pick a way through the boulders. Her need for haste drove her frantic, to the edge of panic; it was doubly frustrating because she knew she was almost back where they'd started. She was almost out of here!

And now she found she'd made a wrong turn somewhere. Deesa looked down a 10 meter drop, could see where the broad path from the Visitor Center ended into Slide Gap. In fact, right below her she could see where they'd all waited when they'd first set out, two days—and most of a lifetime—ago. She could see the *Center*, for Goddess's sake, hunkered on the skyline to the east a kilometer or so away, backlit by the coming dawn.

"Take care of Nature and She'll take care of you." She said the slogan mockingly, hysterically, tears of frustration streaming down her face, tracing jagged lines in the soot covering her cheeks. She looked down again. It was as sheer as made no difference.

But Deesa could see the glow now filling the canyon behind her, even with the dawn now breaking. She thought she could *feel* the glow, and even if that was imagination, shortly kilotons of hot liquid basalt would come spilling down the slope behind her. And that wasn't imagination at all; that was stark reality. She couldn't backtrack and find the right way. She had no time!

Hardly daring to admit to herself what she was going to try, Deesa backed up as far as she could on the ledge where she'd found herself. Then she lowered her head down behind the dashboard, braced her feet against the rests, said a quick prayer to a deity in which she no longer really believed, and turned the throttle all the way forward. The ungainly craft reared back and then lurched forward, jerking again as the spinning front wheels settled down again to make contact with the ground, kicking up bits of black gravel in doing so. She felt herself become airborne as she sailed off the cliff, and she gripped the handlebars desperately while raising herself up off the saddle, remembering also to back off the throttle.

The impact wasn't quite so bad as she'd feared—she managed to stay on the vehicle—but her helmet cracked loudly against the windshield and the left front tire popped with a loud bang. Unable to cushion all the shock with her legs, she also slammed painfully back down into the saddle. She hesitated a minute, trying to get herself repositioned, and then headed up the wide path toward the Center, the flat tire flopping. It pulled to the left, and she found she couldn't gun the ATV as she'd hoped. *The first* really *smooth place*, she thought, *and I can't take advantage of it!* But now it didn't matter anyway. She was almost at the Center, and the basalt would no longer be pursuing her. It would follow the drainage down the Great Slide.

She could now see people waiting, waving frantically, running toward her, in front of the Center.

One of the running people was Ryke. Deesa collapsed into his arms, sobbing, "Oh, *Ryke!*"

"Goddess, I was worried," he said. "I thought I'd lost you. We tried to go back

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when we found you weren't behind us, but . . ."

"I came over the ridge instead. I thought it was a dire emergency." She tried to laugh, but it just turned into a sort of hysterical sob. "And it was so slow, and the lava just kept catching up, and then I got off course right at the end, and . . ." She broke off again, trying to bring her voice under control.

He hugged her tightly. "That was quite a flight you took there. That was good thinking."

He looked back at Slide Gap. "We'd summoned a 'lev, but obviously that's not going to help now," he remarked with attempted casualness. Lurid runnels of molten basalt now advanced out of the Gap, like scouts testing enemy terrain. They poked downhill tentatively, their tips dulling to red and even black as they cooled. But they were continually urged on by the pressure of the hot fluid rock behind, and the solidified rock in turn was overlain and inundated by fresh gouts of lava. Soon enough it engulfed the 'lev track.

But at least the lava was no longer coming toward her. Deesa could almost watch it dispassionately, in Ryke's embrace.

Wylan came out of the Center. He watched them unnoticed for a few moments, an unreadable expression on his face. Then he coughed quietly.

Deesa and Ryke disengaged and looked up.

"I called a copter," Zamer said. "They said they'll be here as soon as they can, so sit tight. We should be okay for a while. We're on high ground, and we can stay inside away from the heat. We have enough water for that, and the building's not flammable.

"At least the Slide will divert the basalt away from us, and from the City, too."

Zamer then noticed the deep cut on Deesa's arm, which was bleeding freely again. "Deesa! You need to get that taken care of. What in the name of the Goddess happened?"

"Oh, it's just a scratch, Wylan," Deesa said.

Both Ryke and Wylan noticed how she evaded the question, but neither commented. Neither mentioned Drafer, either, and Deesa wasn't about to bring his name up.

"There's not quite enough room for everyone this trip. We'll have to come back. The Center visitors get priority, but we can take a couple others." The copter pilot was making an announcement in one of the meeting rooms. The observation dome wasn't yet repaired—the nanofabs were still working on it—so there'd fortunately been few visitors also trapped at the Center.

The building rumbled while they were waiting. Deesa thought the ground actually lurched slightly to one side. But no one else mentioned it. She was dizzy enough—from exhaustion, and perhaps from blood loss, she supposed—that she could well have imagined it, so she didn't mention it either.

"Deesa. You should go." It was Wylan Zamer, insisting. "And you go with her, Ryke. I'll wait for the next flight. The eruption is missing us here." He waved vaguely out the window back toward the gap, where the bright fluid lava was still spilling out and then down onto the Great Slide. He turned and spoke directly to Ryke, low but intense, his eyes blazing. "Take care of her. Take *care* of her." He opened his mouth as though to say something else, but didn't.

Ryke nodded in reply, unable to say anything. Zamer then turned away quickly.

The chopper felt heavy. All seats were occupied, and some people were even standing, hanging onto dangling straps—a gross violation of regulations that, under the circumstances, seemed not to matter a great deal. The din was deafening, between the rotors overhead and the gale-force winds buffeting the

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craft. The pilot lifted the copter up just slightly and then immediately slewed it sideways off the Scarp to get airspeed, with an effect like being in a falling elevator that suddenly fetches up against its suspension cable. The result was more than a few shrieks from the passengers. The ride didn't settle down after that, either. Deesa felt like she would know what being a leaf in a storm must be like before the flight ended. The gigantic eruption was still making its own weather, as air roared in from all sides to replace the rising column superheated by the lava, and the copter was caught in that turbulence.

The copter fought successfully for altitude, and as it rose above the level of the Scarp Deesa gasped at the sight before them. Back of the Scarp a fissure at least 10 kilometers long was welling bright orange basalt, like a gash welling blood. Their camp had been over there somewhere, she realized. The flow fed a serpentine lake of lava, glowing bright orange to dull red, which filled the drainage they'd followed as it wound back and forth between the ridges. Now those same ridges stood as dark peninsulas, punctuated here and by the bright yellow of burning forest and brush. Slide Gap was a chokepoint. Only a relative trickle of brilliant orange was spilling out of it, fading to red as it flowed away to the northeast down the Great Slide. Here and there bits of the 'lev track even still gleamed.

She rubbed her eyes briefly and looked back again. For a second it had seemed the land below was moving, sliding. Surely it was just an illusion from the chopper's sudden lurches. But no, it was real. The land below *was* moving. A kilometer length of the Great Scarp was sagging, gradually oozing downward like a slow-motion video. Deesa grabbed Ryke hard by the hand, pointed wordlessly. "Oh, my Goddess" he breathed, squeezing her hand back. Now the collapse was accelerating, driven by all the added weight of fresh lava behind it. The Scarp was disintegrating before their eyes, crumbling into rubble as though it had been made of nothing more substantial than sand. As they continued to watch, horror-stricken, what had been the lower part of the cliff crumpled into a flow of debris that—pushed from above and behind—continued to accelerate even as it contacted the ground below. Now the advancing debris flow was buoyed by an underlying cushion of trapped air, which lubricated its passage just like an air-cushion vehicle's. The flowing debris rushed onward—directly toward Leopolis.

The Scarp's collapse was like dynamiting a dam. Freed of its confinement on that side, the pooled lava responded, blindly following the urge of any liquid to seek the lowest level, sluggishly at first, and then more rapidly as the barricading rock dropped away. As the lava flowed down, the cooled darker crust that patched its surface here and there peeled away, to reveal the vivid orange glow of the live lava underneath. Lurid streams now plunged over what had been the Great Scarp toward the valley below and the city beyond. An orange tongue now also pointed toward the City, reaching out as though to lick the nearest buildings.

Deesa was chewing her left knuckle, unmindful that she was drawing blood, not noticing even that the bandage on that arm was bright red. Ryke swore softly, "Blessed be Her name. . . ."

The advancing tongue of debris, still moving at better than 100 kilometers an hour, reached the edge of the City. Megatons of moving rock crashed into the first building, tried to spill around it like a current around a stone. The building swayed, back, forth, back; and then, undercut, slowly toppled over like a person tackled behind the knees. The slide raced on, little delayed by the obstruction.

Behind the slide itself came the basalt, flowing more slowly but just as inex-

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orably. Even as it advanced and cooled to blackness, fresh lava behind kept urging it on.

Presently it too was among the buildings of Leopolis. The buildings were made of diamond—or a diamondoid framework, actually, grown as a single crystal by the nanofabs. One of the strongest materials known. But diamond is just carbon, and carbon burns. Or at least it burns at the temperature of molten basalt.

A tendril of basalt, cooling from red toward black, thrust tentatively toward a building. Nothing happened. Another thrust, now still glowing orange. It embraced the building, pooled against the iridescent black sides of the building, its lurid reflection glinting off the sides, flickering in the rising heat waves.

Nothing further seemed to happen for a space, but eventually the black iridescence of the sides grew duller, and they became dimmed with smoke. Holes appeared here and there, too, their edges widened by yellow flames. At length the fiery girdle cut too deeply and too unevenly into the base of the gigantic structure. Undone by its own weight, the tower started to fall reluctantly and sluggishly, like an enormous tree. It shattered on impact like the gigantic crystal it was.

Ryke surveyed the fresh basalt plain, crusted blackly but still far too hot to approach. "Take care of Nature, and She'll take care of you." He shook his head. "She took care of us, all right." They stood atop one of the surviving towers on the higher ground to the southeast, where they—and the few other survivors—had taken refuge. They looked out over a hellish scene: jagged stumps of buildings, jutting up through the dark surface like gigantic burned trees, flickering in the heat waves rising off the still-cooling lava; the Aldo River, diverted by the lava, pooled into a dreary reservoir that steamed where it lay next to the cooling lava, full of charred wood, animal carcasses—and yet other things, things that did not invite closer inspection.

Deesa was still numbed by the previous day's events. His comment hardly registering, she asked aloud, almost as though not addressed to anyone in particular. "Do you think he knew?"

"Huh?" Ryke, sunk in his own thoughts, didn't follow her comment. "Nature's not benign. She's just indifferent," he said almost to himself, continuing his own musings.

"About Wylan," Deesa said again. "Do you think he *knew*? He must have known *something*. He must've realized, with the weight of all that new lava . . ."

Ryke paused. "No, I don't think so. He figured he'd be perfectly safe till the chopper came back. He didn't think the Scarp would collapse." Ryke tried to make himself think so, too. He couldn't quite manage to be as sure as he sounded.

It was not a comfortable topic. He changed the subject, saying, "Things are going to be different now. *Very* different. Leopolis is two-thirds destroyed. There has got to be . . ." he paused. It was hard to say it, as it was just beginning to sink in how many friends and relations they had to have lost, but he continued with an effort, ". . . got to be tens of thousands dead. No one's going to believe in Nature now. Nature has betrayed us." He spat off into the void, trying to deflect his dawning grief into anger.

"And one thing's for sure. We don't have to live just here. We *won't* live just here, not in these tall black coffins." Collecting himself with an effort, he looked beyond the sad devastation, off toward the distant smudge of the Everwinter Mountains.

Deesa also looked toward them, with a newly speculative expression in her eyes. ■

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Science Fact

Pollution, Solutions, Elution, and Nanotechnology

Stephen L. Gillett, Ph.D.

In a cavern, in a canyon,
excavatin' fer a mine,
Lived a miner, Forty-Niner,
and his daughter, Clementine.
—My Darlin' Clementine
(traditional American folk song)

A mine. Traditionally it conjures up a romantic but gritty image. A trove of valuable metal, often in a remote or exotic place: remember the Phoenicians bringing tin all the way from Britain to the eastern Mediterranean. And often there's a sense of winning the lottery ("We've struck it rich!"), because valuable ore is hard to find, being both rare and localized. Think of gold from California or the Spanish New World, silver from the Comstock Lode; even the iron from Michigan's Upper Peninsula that helped fuel America's industrialization.

But the image also evokes backbreaking and dangerous toil. Think of the slaves in the mines of Laurion[1], extracting silver for Periclean Athens. Think of the legions of miners digging coal to fuel US industry, an occupation poignantly portrayed in the movie *October Sky*. Remember the goldfields of Kolyma, the most brutal of Stalin's gulags.

And such images, of course, have been routinely carried over into SF. We've heard a lot about mines on other planets. We've been told about planets that are valuable *just* for their mines, especially in pop SF such as Star Trek. Mines worked as part of a penal colony have even become a cliché ("You're sentenced to the thorium mines!").

[1] Or Laurium, in the Latinized form.

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Asteroid mining in particular has made the transition to serious futurism, as shown by John S. Lewis's book *Mining the Sky*. Obtaining nickel steel and precious metals from iron-rich asteroids has become a given in many space development scenarios. Of course, the notion was invented in SF, a great deal of it right here in *Analog*: see stories like Randall Garrett's "Anchorite" (Nov 1962), for example.

But as with so much else, The Future Ain't What It Usta Be. Mining is becoming obsolescent—and its demise is taking a whole lot of Future Histories with it.

Separation: A Fundamental Technological Problem

Let's back off for an overview to see why. Long-time *Analog* readers will note that I've touched on some of this ground before ("Beyond Prometheus", Dec 1993; "The Environment, Technology Drivers—and Nanotechnology," Nov 1994; and "Near-Term Nanotechnology," Oct 1998), so I'll skim it quickly. What we really have is a *single*, fundamental technological problem: separating one kind of atom or molecule from an arbitrary background of other kinds. It's a matter of context: if we *want* what we separated, it's a "resource;" otherwise it's a "pollutant."

Usually, however, separation has been regarded as a host of different problems. Resource extraction especially has generally been seen as distinct from (say) pollution control or purification, because it's traditionally been carried out with a spectacular suite of processes. It's also thought of as intrinsically energy-intensive, from those inchoate impressions of gigantic open pits, fiery smelters, and armies of heavy equipment hauling tons of dirt. Even in the US, which imports a great deal of its primary materials, primary metals and nonmetals production still accounted for some 3.5 Quads (quadrillion BTU) of energy consumption in 2003, about 4% of total US energy usage (US-DOE, *Annual Energy Review*, 2004). In turn, this profligate energy usage is typically justified by vague appeals to the laws of thermodynamics.

The "Thermal Paradigm"

In fact, however, element separation is *not* intrinsically expensive, as is easy to show by actually working out the thermodynamics quantitatively. The fundamental cost of element extraction is set by the difference of a quantity called the "Gibbs free energy" between the beginning ore mineral and the extracted metal. If the ore mineral is an oxide, this fundamental cost is only some 5-15% of the energy actually spent—and this ignores the crushing and grinding costs I mention below.

Worse, though: most ore minerals are *sulfides*, and thermodynamically it's possible to oxidize just the sulfur to *get* energy, with the metal being a by-product! Chemolithotrophic bacteria nearly manage to achieve this. Present technology, of course, doesn't even come close. The sulfide ore is "roasted" to the metal oxide, so that all the energy is just thrown away.

Conventional resource extraction is so energy-expensive because it relies on using *phase changes*—melting, crystallization, vaporization, and so on—and those phase changes are usually driven by the application and extraction of vast quantities of *heat*. Essentially we're exploiting the self-organization of kazillions of atoms as the desired element separates ("partitions") into one of the phases. Iron oxide, for example, reacts with carbon to yield carbon dioxide, which wafts off to leave the molten iron behind. Furthermore, any silicate ("rocky") impurities form a molten glass (a *slag*), which can be poured off separately. Molten iron and molten slag do not mix, just like oil and water.

Not only are such processes grossly energy intensive, they are intrinsically polluting, not just from the combustion

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necessary to generate the heat, but also because the separation is never complete. Some of the desired element always goes into the "wrong" phase. Moreover, by-products containing geochemically abundant elements are usually uneconomic and discarded as waste. Copper ores always contain iron, for example, but the iron is thrown away.

Finally, these processes require feedstocks ("ores") that *already* are geologically anomalous! That's why the travel to remote locales is so often necessary.

Their only virtue is simplicity. We've been digging up and cooking anomalous geologic deposits for the last 5000 years or so. But conventional pyrometallurgy squanders energy. Or, as I put it these days, the more spectacular a technology, the cruder it probably is.

The Biological Example

Furthermore, you don't need to trust abstract thermodynamic calculations to see that separation isn't intrinsically energy-intensive. You just have to look at biology. Organisms carry out feats of separation that put conventional resource extraction to shame. And they do it with a lot less sound and fury. Plant roots extract both nutrients and water at low concentrations from the ambient soil. Vertebrate kidneys extract only certain solutes out of the blood from a background of many other solutes. For photosynthesis, plants extract carbon dioxide from the air, where its concentration is only about 350 parts per million (ppm), and do so using only the diffuse and intermittent energy of sunlight. "Shell builders" such as mollusks extract calcium carbonate from the surrounding water to build their shells. Diatoms, a type of single-celled alga, are particularly impressive: their shells are a low-temperature silica glass, made from silica extracted at ppm levels in the ambient water.

Obviously organisms do not carry out thermally driven phase separation. Instead, they literally move individual atoms or molecules, using specialized molecular mechanisms; e.g., the binding of nutrient elements by specialized proteins. This is not only vastly less costly energetically, but allows separation from considerably lower concentrations.

Molecular Separation: Technological Approaches

Well, mentioning "molecular mechanisms" for separation shows where the nanotechnology is going to come in. Furthermore, thermal-based separation simply won't work for those problems of pollution control and purification. That's, of course, why such problems are traditionally viewed as distinct from resource extraction.

In their simplest form, molecular separation techniques require that the material being separated be free to flow, as a gas or a liquid. Hence, in the rest of this article I'll focus on aqueous solutions, both because of their importance and because they are technologically easier to deal with. The problem of comminuting solid materials doesn't arise—a solution is *already* broken up at the molecular level! In many cases, too, solutes in aqueous solution have an electric charge—they're "ions," having lost or gained one or more electrons—and that can actually make separation easier, because the electric charge gives a "handle" for manipulating the ion. At least in theory.

So what are some approaches to molecular separation? *Semipermeable membranes* are in essence "molecular filters" that strain out one or more solutes. In *reverse osmosis ("RO")* the separation is driven by a pressure difference across the membrane, while in *electrodialysis ("ED")* ions are driven across a membrane in response to an electric field. Both are now used in desalination, RO for seawater, ED typically for brackish water.

Molecular sieves, such as *zeolites,* have open crystal structures into which only certain molecules can fit. Hence

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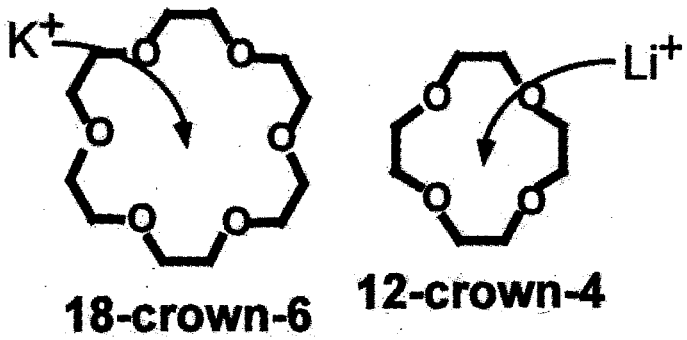

Figure 1. Crown ethers. Selectivity depends on the fit of the ion inside the ring.

you can literally "sieve" certain molecules out of a mixture. Commercial machines for extracting oxygen from the air, for example, which are now commonly used in place of oxygen tanks by people requiring supplemental oxygen, exploit the fact that oxygen molecules are preferentially taken up in voids in sodium zeolite A, whereas nitrogen molecules (which make up 78% of the atmosphere) are not.

Ion exchange is a well-established technology for "swapping out" dissolved ions. Ion exchange materials include zeolites and various polymers ("resins") that have electrically charged molecular groups to which the ions can bind. The ion in solution has slightly greater affinity for the binding site, and so displaces the ion that's already there (hence ion "exchange.") Water softeners are a familiar example: calcium ions in tap water, which make it "hard," are swapped for sodium ions.

Since I'd already mentioned these approaches to molecular separation in those previous articles, here I'd like to focus on yet another approach: specific molecules that can bind tightly with other molecules, or ions, to form highly stable "supramolecular" structures, or "complexes." In recent decades, a tremendous amount of research effort has especially been directed toward molecules with branched ("*chelate,*"[2] from the Greek for "claw") and ring (*macrocycle*) structures, which can "wrap around" certain solutes very tightly.

Consider "crown ethers," for example. To a chemist, an "ether" contains hydrocarbon groups linked by an oxygen atom. The anesthetic ether of years ago, for example, is diethyl ether. It consists of two C_2H_5 ("ethyl") groups linked by an oxygen: $(C_2H_5)_2O$. A "crown" ether is a ring-shaped ether, and it can bind very tightly to a positive ion that fits inside the ring. For example, "18-crown-6" forms a strong complex with potassium ion, which fits nicely into the ring, while the smaller ring of 12-crown-4 strongly binds lithium ion, but is too small to accommodate potassium (Figure 1). Crown ethers were only discovered by Charles Pedersen in 1967, who at the time was an industrial(!) chemist working at DuPont. He shared the 1987 Nobel prize for his discovery.

Of course, just making a complex with a solute doesn't do much good for *separation*. The whole complex is still dissolved! (This can be useful therapeutically, though. Toxic solutes in body fluids can be rendered much less harmful

[2] KEE-late.

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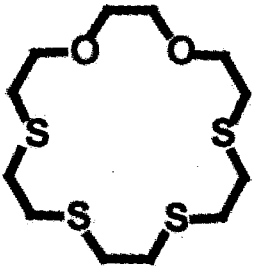

1,4,7,10-tetrathia -18-crown-6

Figure 2. Substituted crown ether. Because of the replacement of O by S, this macrocycle has a selectivity for Ag^+ over Na^+ of $>10^{10}$.

by being bound into a complex. Often, too, that complex can then be recognized and extracted by the kidneys. A number of antidotes work this way.)

One approach to a practical separation system is to chemically link—"tether"—the complexing agent to a substrate to form a highly selective surface for extracting particular solutes from solution. Think of a surface covered with molecular lassos, out there waving in the breeze ready to snare passing ions. For example, palladium is recovered by dissolving scrap catalytic converters in acid. Tethered macrocycles on a silica surface bind the dissolved palladium to form complexes, while the other, much more abundant metals (iron, aluminum, etc.) remain in solution. As of this writing (early 2005), palladium is selling for about $200 per troy ounce.

Solute Selectivity

I implied in the previous section that *selectivity* of extraction is important. In fact, it's fundamental. We usually want to extract just one particular thing and leave the rest. (Heck, that's why *ores* were important in the first place! They contain what we want, already pre-concentrated.) Sometimes the particular solute is valuable, as in the example of palladium above. Another example is dissolved lithium ion, which is always much less abundant than sodium, but which is considerably more valuable. Other times the thing we want to get is toxic. Dissolved lead, for example, has chemical similarities to innocuous but much more abundant calcium—the ions have the same charge and are about the same size.

One way selectivity is determined by the "lock and key" fit of the solute into the complexing agent. We saw this above with the crown ethers. Electrostatic attraction also plays a substantial role for charged species: obviously, for example, binding is *not* favored when the ion and the complexing agent have the same charge!

More subtle factors of the electronic structure also come into play. For example, polarizable ("soft") ions like silver, whose electron cloud is more readily distorted by the external electric fields from other atoms, have more affinity for "soft" atoms like sulfur. Conversely, "hard" ions like sodium or potassium will "prefer" complexes with a "hard" atom like oxygen. And there's no rule that says, for example, that other atoms

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can't be substituted into crown ethers. For example, the compound formed by replacing 4 of the oxygens in 18-crown-6 with sulfur (Figure 2) forms complexes with silver ion in preference to sodium ion by a factor of over 10 billion. Silver, of course, is lots rarer than sodium! In fact, this substituted crown ether is also the one used to recover palladium in the system I described above.

The reasons why a complex is favored can get extremely subtle indeed, and are not always understood. As I'll discuss more below, for example, the simple cyanide ion (CN^-) has an extraordinary—and poorly understood—affinity for gold.

The "Elution Problem"

Once your complexing agent fills up, now what? Somehow the complexes must be broken up to release the solute, which is what you wanted in the first place, and free the complexing agent so that it can extract *more* solute. The problem's made even worse by the fact that the *greater* stability of the complex formed by the solute and the complexing agent is what drove the separation in the first place! In other words, the better the solute extraction, the tighter the binding.

This is the major problem with complexation-based approaches to separation: eventually the solute must be extracted ("eluted") and the complexing agent regenerated. (Or you can just throw away the filled-up agent. This is sometimes practical for waste disposal, when you're dealing with small amounts of an extremely toxic solute. Mercury is a real-world example. But at best it's an inelegant solution to the problem.)

Typically regenerating the complexing agent takes extreme chemical measures. This is already familiar with ion exchangers: water softeners, for example, must be periodically recharged with brine. The concentrated sodium chlorine solution overwhelms the ion-binding sites, replacing the calcium with sodium so that they can be used for calcium exchange again. It's even worse with metal-complexing agents, because the binding is so much tighter. In the palladium recovery system mentioned above, for example, highly concentrated acid must be used to flush out the complexed palladium.

Obviously, such regeneration steps generate a much larger volume of waste water (brine or acid waste) that now becomes a serious disposal problem. Indeed, further separation step(s) are now typically required; overall, you've made the problems worse, as you now have *more* solution than you started with! Separation requiring elution can still be practical if you're recovering relatively small quantities of something very valuable like palladium, but its applications are obviously limited.

Switchable Complexes

"Switchable" binding is a way to solve the elution problem: under one set of circumstances binding occurs, but changing some variable causes the solute to unbind again. Again, biology has anticipated technology. Hemoglobin, for example, binds strongly to oxygen in the lungs, but under the different chemical conditions elsewhere in the body, it gives up the oxygen to the tissues. The hemoglobin molecule actually changes its configuration in doing so.

A simple example of switchable binding is electrosorption, which is based on straightforward electrostatic attraction and repulsion. Charging an electrode attracts out ions having the opposite charge; reversing the charge of the electrode desorbs the ions again. Electrosorption was first proposed in the 1960s for desalination, but remained impractical until the recent advent of very high surface area electrodes. Since the "filled up" electrodes look like a charged capacitor, too, a great deal of the electrical energy can be recovered when the electrode polarity is switched to desorb the ions.

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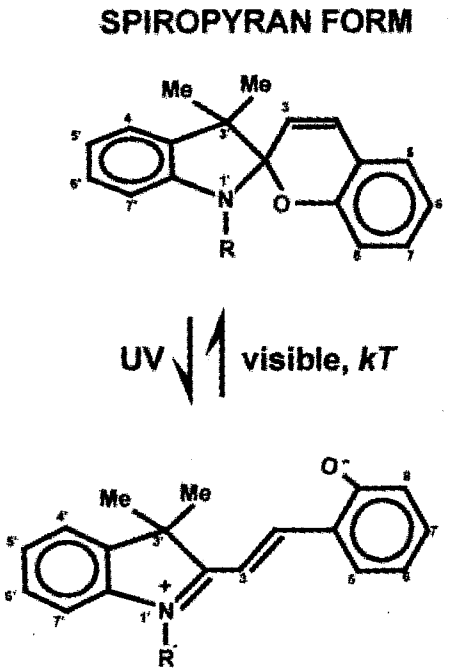

Figure 3. Spiropyran photochromism. Absorption of an ultraviolet (UV) photon flips the molecule into the open, "merocyanine" form. Visible light or room temperature (*kT*) flip it back into the spiropyan form. With appropriate side groups at R and the numbered positions, reversible light-driven ion binding can occur. "Me" is the methyl (CH_3) group.

More sophisticated—i.e., selective—approaches require more molecular-scale structuring. For example, certain electrodes can selectively take up particular ions because the crystal structure of the electrode has voids into which only those ions will fit. In particular, a process for extracting lithium ion from brine has been patented that uses electrodes made of λ (Greek letter lambda) manganese dioxide (MnO_2) (Kanoh et al., 1993ab). This oxide contains narrow open tunnels running through its structure. In the load cycle the electrode is made negative. This forces some of the manganese atoms to pick up an additional electron (they're "reduced"). This leaves the crystal with an overall negative charge, so positive lithium ions are drawn into the tunnels in the structure to compensate. Lithium ions can fit into these tunnels, but the much more abundant sodium ions cannot because they're too big. Reversing the charge on the λ-MnO_2 electrode then expels the lithium.

A similar system for extracting cesium ion is based on cesium nickel hexacyanoferrate ($CsNiFe(CN)_6$) (Lilga et al., 1997). Here the crystal structure contains large cavities that can accommodate the big Cs^+ ion. Iron is reduced by

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applying a negative voltage, causing cesium ions to be drawn in to compensate. The system is of great interest in nuclear waste cleanup because of the isotope ^{137}Cs, which is both highly radioactive and has a half-life just long enough (about 30 years) to remain a hazard for decades.

An alternative potential "trigger" for switching binding is light. One way is to use molecules that change their structure on absorbing a photon. The molecular "backbone" of spiropyrans (Figure 3), for example, rearranges so drastically that a solution containing the molecule actually changes color when illuminated, a behavior termed "photochromism." Strategically placing complexing sidegroups on the backbone means the molecule can go from binding solutes in its ground state to releasing them when it's illuminated, an idea explored in a recent thesis (Alward, 1998).

Other researchers have put double bonds, either between carbon atoms (C=C) or between nitrogens (N=N), into macrocycle-type compounds. In its ground state, such a double bond is rigid, strongly resisting rotation. On absorbing a photon, though, the molecule goes into an excited state in which the bond is free to rotate. When the excited state drops back to the ground state again, the double bond can "latch" into a position 180° from its original orientation. Obviously, if the double bond is part of a macrocycle, this completely changes the shape of the ring. Since, as I described above, what a macrocycle binds to depends a lot on how it fits in the ring, changing the ring size and shape *really* changes the effectiveness of the binding! Again, though, although such systems have been demonstrated in the lab, they're a long way from being practical at present. Not only are the molecules used too vulnerable to degradation over time, but they're really expensive to make with conventional synthesis techniques.

A different approach envisions using the absorption of light by a semiconductor surface. Absorbed photons excite electrons while leaving behind vacancies or "holes," and these are active chemical species that could drive some sort of molecular mechanisms at the surface. For example, a surface might adsorb ions from a solution in the dark, but on illumination desorb those ions. Merely shining sunlight on a surface to desorb its solutes would obviously be a lot cleaner and "greener" than flushing it with strong acid solutions.

Unfortunately, such systems are even more embryonic. Yours truly has helped develop a "toy" example that reversibly extracts ferrocene from solution. Ferrocene, $Fe(C_5H_5)_2$, is a highly stable molecule in which the iron atom is "sandwiched" between two 5-membered hydrocarbon rings[3]. In its neutral state, as you might expect from all those hydrocarbons, the molecule is insoluble in water, but it's soluble in organic solvents such as—unsurprisingly—liquid hydrocarbons. The iron atom also gives the molecule, and its solutions, a rusty-brown color. However, ferrocene can lose an electron (be "oxidized") to the "ferricenium" cation, which *is* soluble in water. In fact, it makes pretty baby-blue solutions.

For our semiconductor surface we started with nanocrystalline titanium dioxide (TiO_2), a "wide-bandgap" semiconductor that's been the subject of much research (see "Artificial Photosynthesis," April 2005). We chemically attached a hydrocarbon layer to the TiO_2, which changes its surface properties drastically. It's now "waxy" and resists mixing in water. Then we dispersed this "functionalized" TiO_2 in a ferricenium solution and shone UV light on it. Over

[3] Its full, formal chemical name is dicyclopentadienyliron (II). Say it ten times while holding a burning match . . .

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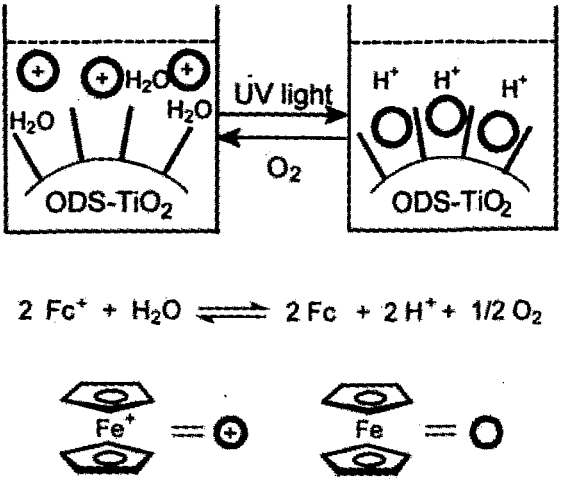

Figure 4. The ferrocene switching system of Muraoka et al. (2002). "Fc" is ferrocene, the "iron sandwich" $Fe(C_5H_5)_2$, consisting of an iron atom (Fe) between two 5-membered hydrocarbon rings (see the sketch at the lower right below the c chemical reactions). It's represented in the diagram above by heavy open circles, as indicated by the "=" sign. Similarly, Fc^+ is ferricenium, ferrocene that's lost an electron, as shown in the sketch at lower left. It's represented by heavy circles containing a plus sign. "ODS-TiO_2" is titanium dioxide (TiO_2) whose surface has been covered with a hydrocarbon "fuzz," represented by the "hairs" sticking out of the surface. Electrons generated by shining light on the TiO_2 react with ferricenium in solution to reduce it to ferrocene, which then dissolves in the hydrocarbon fuzz atop the TiO_2. In the dark the ferrocene re-oxidizes with atmospheric oxygen (O_2) and returns to solution.

the course of a few minutes, the baby-blue solution becomes clear, while the (originally) white TiO_2 becomes rusty brown. Put the system back in darkness for 30 minutes or so, though, and the baby-blue color returns while the TiO_2 again becomes white.

What's happening? To simplify a bit, we finally figured out that excited electrons from the TiO_2 reduce the dissolved ferricenium to ferrocene. It then leaves the water behind to dissolve in the hydrocarbon layer on the TiO_2, turning it brown. In the absence of light, though, atmospheric oxygen re-oxidizes the ferrocene to ferricenium, which returns to solution. See the sketch in Figure 4 (and the full write-up in Muraoka et al., 2002).

The problem? Well, first, the system breaks down pretty quickly. It only cycles a few times. More important, though, there aren't any Superfund sites with ferrocene! If we could make a light-switchable system work with some hazardous "hot-button" chemical, though...

Nanotechnology and the "Solution Solution"

Obviously, these molecular-level separation technologies would be much more practical if there were better control of their fabrication at the nanoscale. Indeed, one reason for the efficiency of biological systems is that biosystems *do* organize themselves at the molecular

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level. In particular, the conventional synthesis of macrocycles and similar compounds leaves a lot to be desired. One result is that typically the compounds themselves are considerably more valuable than the metals they are to extract!

All *Analog* readers, of course, know that nanotechnology aspires to the control of matter at molecular and near-molecular scales, in emulation of the capabilities of biosystems. Separation technologies are both an obvious early application of nanotechnology and an obvious motivator for its funding, as high-value economic drivers exist. Moreover, the molecular-level technologies described above are largely passive systems, and hence considerably simpler than the full "molecular machines" often seen as the goal of mature nanotechnology.

At present, pollution control and purification are the key economic drivers. As separation technologies mature, however, they will blur the distinction between a "pollutant" and a "resource." Moreover, recovered pollutants will begin to have an impact on resource extraction; after all, copper (say) extracted from a wastewater stream is copper that does not have to be mined. Ultimately, a great many aqueous solutions, of both natural and artificial origin, will become non-traditional resources. Wastewater streams, acid-mine drainage, seawater, concentrated natural brines such as those in oilfields or saline lakes—all become potential sources of materials. The largest unconventional tungsten deposit in the US, for example, is the brines of Searles Lake, California. They contain about 50 ppm in the form of the tungstate ion ($WO_4^=$).

Nanotechnological separation technologies are thus likely to become "disruptive technologies" (Christensen, 1997). Such a technology is initially more expensive and less capable, but becomes quietly established in niche markets where it has distinct advantages. There it improves until it can invade established markets—to the surprise of those in those markets. A familiar example is high-end PCs supplanting mainframes.

Hydrometallurgy

Of course, we can also deliberately dissolve raw materials and then extract what we need. In fact, "hydrometallurgy"—leaching desired elements out in solution, and then extracting those elements from the leachate—has a distinguished history. A mining engineer has told me that my scenarios are "hydrometallurgy to the max."

For one example, in the last few decades a growing percentage of copper production has come from hydrometallurgy. Low-grade ores are sprinkled with sulfuric acid, and processing the resulting metal-rich solution shows the importance of selectivity. Lots of other metals, iron in particular, also are dissolved, but complexing agents—oximes—bind with Cu specifically. The oximes are dissolved in a kerosene solution and actually draw the copper out of the aqueous phase, a process called "solvent extraction."

The most extraordinary current example of hydrometallurgy is that of gold. In the late 1800s, gold's extractive metallurgy was revolutionized by the discovery that the cyanide ion (CN), better known then and since as a virulent poison, has an absolutely extraordinary affinity for gold. In the presence of air, metallic gold *dissolves* in dilute(!) cyanide solutions to form the dicyanoaurate (Au(CN)2-1) complex. About the only other thing that can dissolve gold is aqua regia, an unstable and spectacularly corrosive mixture of hydrochloric and nitric acids. Cyanidation, even more than gold discoveries such as the Witwatersrand and Klondike, was responsible for an increase in Au production that began in the 1890s and has continued off and on to the present. Reprocessing old tailings wasn't nearly so glamorous as prospectors slogging it up

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to Skagway, but it was considerably more effective in increasing gold output. (It was also a lot more lucrative.) Ongoing improvements in cyanidation in the twentieth century, such as heap leaching, have now reached the point that, in favorable cases, gold can now be recovered from rocks containing less than 1 ppm (1 gram per tonne). ("Goldbugs" who advocate a return to the gold standard because "you can't print gold" should beware: its supply is not so limited as they imagine!)

Why do cyanide and gold have such an affinity? There must be a good fit of their electron clouds due to some quantum-mechanical quirk. So far as I know, that quirk isn't understood in any detail, but as computing power continues to improve, the techniques of computational chemistry (see "Digital Matter," Feb 1999) should be able to give some insight. In turn, perhaps such insights could be used to *design* complexing agents for other valuable metals such as platinum. Leaching platinum at sub-ppm concentrations? At a meeting several years ago, a would-be asteroid miner dismissed the possibility out of hand when I brought it up.

Yeah, and canal companies didn't take railroads seriously, either.

In any case, the five-millennia-old paradigm of "dig ores up and cook them" is coming to its end. And that end isn't likely to be caused by asteroid miners dropping metal to an exhausted Earth, either. ■

Postscript

The ideas herein (and many others) are treated at greater length, and with copious primary references, in my white paper *Nanotechnology for Clean Energy and Resources* at the Foresight Institute: www.foresight.org.

References

Alward, M. R., The synthesis, analysis and applications of photoreversible metal-ion chelators, unpub. Ph.D. thesis, Univ. of Pittsburgh, 1998.

Christensen, Clayton M., *The Innovator's Dilemma*, Harvard Business School Press, 225 p., 1997.

Kanoh, H.; Ooi, K.; Miyai, Y.; Katoh, S.; Electrochemical recovery of lithium ions in the aqueous phase, *Sep. Sci. Technol.*, *28*, 643-51, 1993a.

Kanoh, H.; Ooi, K.; Miyai, Y.; Katoh, S.; Method and electrode for electrochemical recovery of lithium values from aqueous solution, US Patent 5,198,081, 7 pp., 1993b.

Lilga, M. A.; Orth, R. J.; Sukamto, J.P.H.; Haight, S.M.; Schwartz, D. T.; Metal ion separations using electrically switched ion exchange, *Sep. Purif. Technol.*, *11*, 147-58, 1997.

Muraoka, M.; Gillett, S. L.; Bell, T. W.; Reversible photoinsertion of ferrocene into a hydrophobic semiconductor surface: A chemionic switch, *Angew. Chem. Int. Ed. Engl.*, *41*, 3653-6, 2002.

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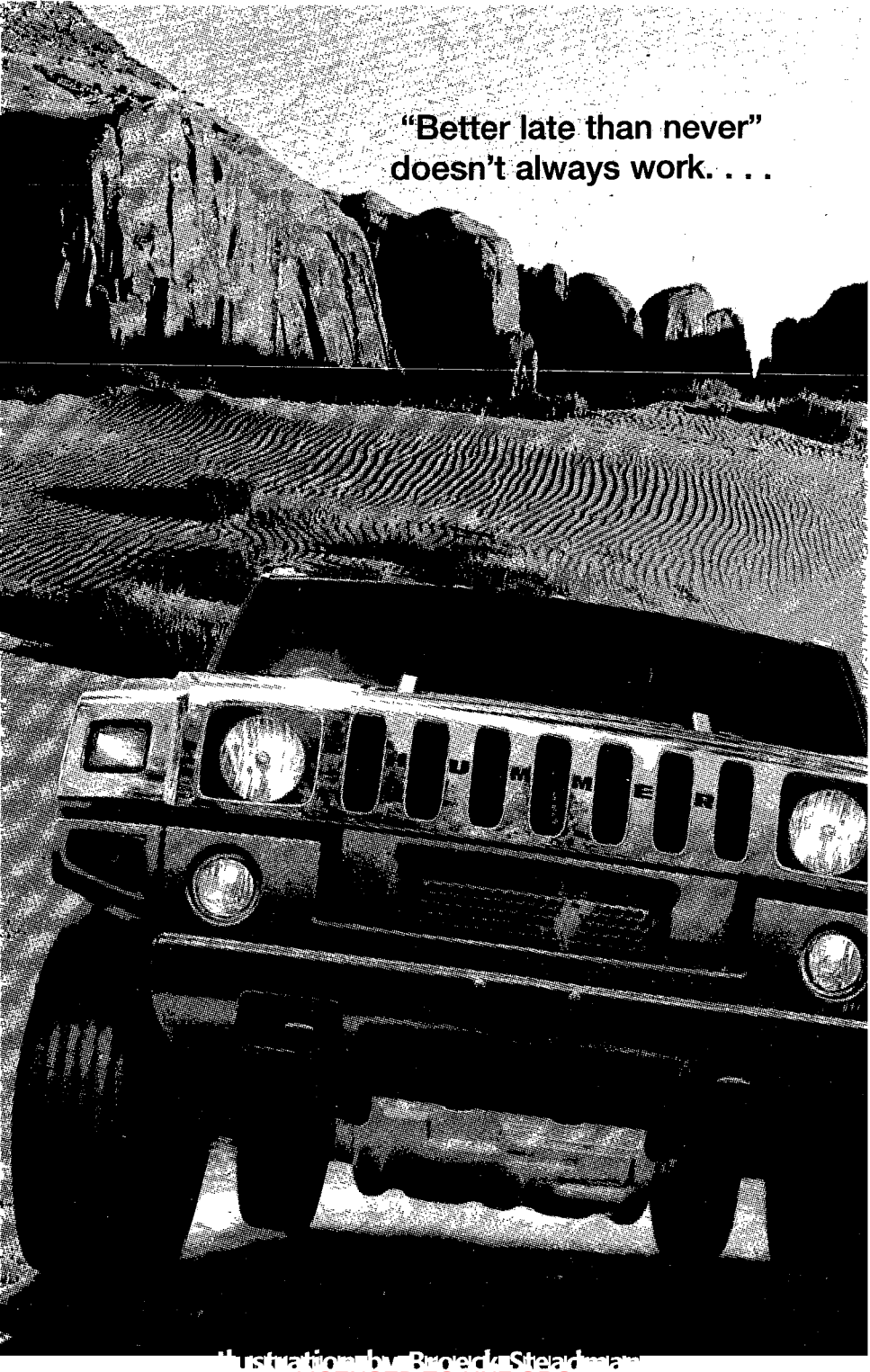

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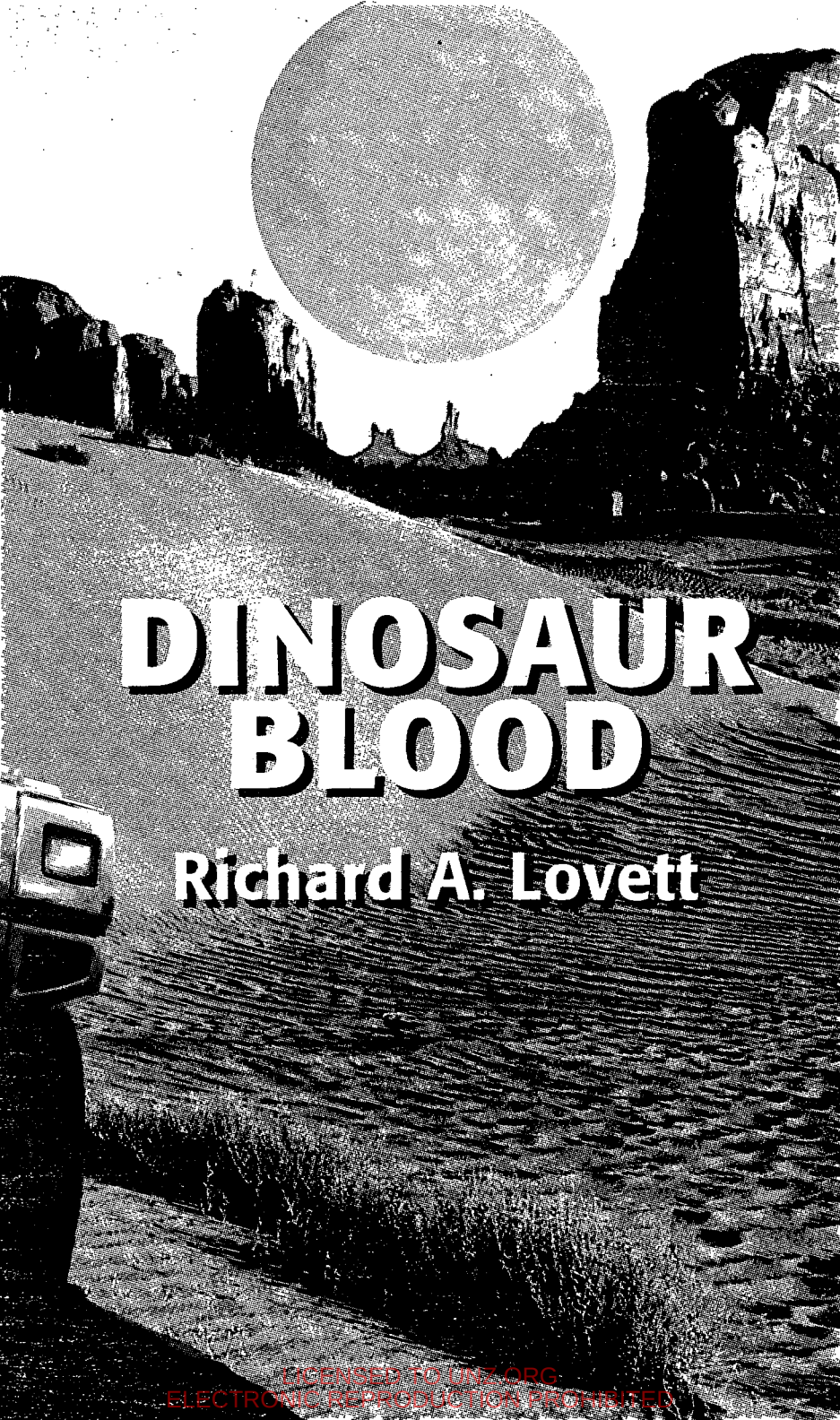

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The last gallon of gasoline was consumed on May 22 of a year best left to the imagination. But its story started long before, beneath the crystalline light of a younger Sun, and the manner of its consumption would dictate the fate of the planet for millions of years to come.

The beginning came in a forest where plants, using photosynthetic pathways that would persist unchanged for much longer than the gasoline, fought to capture that young Sun's energy. Those that succeeded grew quickly, but that made them weak and many toppled in hurricanes wandering inland from an unnamed tropical sea.

Beneath the plants, animals sought shelter from the storms, but all too frequently that was elusive. Floods washed bodies and debris into marshes where there wasn't enough oxygen for them to decompose before the next storm brought more mud and more debris, until everything was buried so deeply it began to bake under the slow heat leaking from the Earth's interior.

Patiently, the Earth cooked this rich organic stew. It blended the remains of logs and ferns with those of dinosaur bones and blood until the resulting goo began to percolate upward, only to be trapped beneath a dome of impenetrable rock. There it stayed, in a place that would one day be part of the Macedonian Empire—and then of Rome, Persia, Iran, and more, as the species that inherited the globe from the dinosaurs divided it with imaginary lines, fought over them, drew more lines, and fought again.

Then, geologists spotted the dome in a survey of the world's last oil supplies. It wasn't large, but the surveyors marked their maps and bided their time. Later, other people drilled into it and liberated the precious ooze that carried the energy of that ancient sun.

By this time, oil was prodigiously expensive. Ninety percent of the reserve was purchased by a petrochemical company that used it to make specialty chemicals for which it was still the best feedstock. The rest went to a real estate magnate who had it refined into gasoline for his antique car collection, happy to have a private supply, because the old engines did not run well on biofuel.

Even a small oil deposit makes a lot of gasoline. But "a lot" isn't the same as "more than you'll ever need." Eventually the tycoon's stockpile ran low. He hoarded it, using less and less until, in his dotage, he used almost none. Then he added the remainder to his granddaughter's trust fund and discovered that, ultimately, even trillionaires must die.

Family fortunes typically dissipate in three generations. Occasionally, they persist longer, but more often the entrepreneurial spirit peaks with the first generation, wanes in the second, and scatters with the third.

By this standard, the tycoon's family fared well. The granddaughter studied science and business in college, then went to graduate school and multiplied her inheritance in a field that merged nanotech with materials science, allowing her to forge buildings from stronger, lighter materials than any her grandfather had ever known.

It was a critical technology for an economy driven by energy shortages because it allowed all but the largest projects to rely on local feedstocks. These materials did not need to be shipped for long distances, and while the new economy still used liquid-fuel vehicles when necessary, the sad fact was that the Earth had a great many people but only a fixed amount of arable land, and there was a limit to how much could be devoted to biofuel. Nature and the marketplace had finally forced the human race to conserve.

Nanotechnology had also improved life expectancies, and the granddaughter lived to a ripely Methuselan age. But eventually she too succumbed, and the

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gasoline passed to her sole heir, her own granddaughter.

That granddaughter was named Trista, and she was of the more standard third-generation mold. She'd been a trust-fund orphan since early childhood, when her parents died parachute skiing in the eastern Karakoram, and by the time she was a teenager, she was doing everything she could to make inroads into the family fortune. Then she turned twenty-one, and everything became hers.

Shortly before her birthday, Trista discovered her great-great-grandfather's cars. They were in a museum, but had never been donated—merely loaned. The gasoline was in a double-walled eco-tank that the landscaping crew eventually located beneath a bed of rosebushes. Happily, one of the tank's walls was still intact—testimony to a former generation's engineering skills—and her trustee found a chemist who said that with a bit of reprocessing, the fuel would be usable.

She spent days choosing her car. The two-seater sports car looked fast and sleek, but how could she pick just one person to ride with her? The minivan would solve that, but it looked kind of boxy and not all that much fun, and above all, turning twenty-one and inheriting a bottomless pit of money was supposed to be *fun*. Eventually she settled on something the museum plaque called a Hummer (a.k.a. Humvee). It was eye-searingly yellow and weirdly squat, but it looked like it could roll over just about anything, and that in itself could be fun. Maybe she'd just run it through cornfields and cow pastures and let her attorneys deal with the costs. They'd pretend to scold her, but secretly they'd be happy because the legal fees would put their children through any college in the land. Maybe when she was done with it, she'd just *give* them the Hummer.

The museum informed her that, pretty as it was, the Humvee hadn't been driven in years, and nobody was sure how to make it work. *Fix it*, she told them, throwing in the magic words: *I'll pay*. Trista had grown up with absentee guardians and a trustee, and had long ago learned to make it work for her benefit. *Just be sure it's ready for my birthday.*

While she was at it, she asked the museum to find someone who could build a sturdy tank-trailer for the reprocessed gasoline, so she wouldn't have to have it airlifted in every time she needed to refuel. Not that she couldn't afford to have that done, but 'copters were scarce, and who wanted to twiddle their thumbs waiting for one out in the boondocks? Of course, she could just buy a 'copter and have it follow her, but that would wreck the sense of being on her own.

Not that she would really be all that isolated. The time had passed when a young woman, even an obviously wealthy one, risked much by venturing off on her own. Wherever she went, she was protected by gnat-cams, controlled by a base unit that doubled as a wristwatch. The cams couldn't stop an attacker, but they were all the deterrence she'd need. All of her friends had them, even if theirs weren't as sophisticated as hers, and any potential bad guys knew it. Trista's base unit was smart enough to spot an emergency even before she did. It would then activate a sat-link and yell for help, all the while providing enough telemetry to ensure that any attacker was certain to be caught. Better yet, she'd long ago figured out how to jigger the memory so that it automatically purged old data. She couldn't actually imagine one of her guardians bothering to check up on her, but it was nice to know they couldn't.

She'd not given the engineers as much lead-time as they wanted, and the trailer, Hummer, and gasoline were barely ready by her birthday. But the promise of substantial bonuses prevailed, and when it came down to it, the hardest part, really, was deciding who would share what she was billing as the last great adventure.

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Her first thought was of Rhona, who knew something about virtually everything and was a nethead who could instantly learn the rest. She'd provide interesting commentary, wherever they went, but she was also way too serious and would probably talk endlessly about how Hummers had helped wreck the economy or lose a war or ruin the environment or do something even more awful.

Better companions would be Kammi and Yomiko, who loved nothing better than a good party. Years ago, the three of them had snuck into the wine cellar and learned to drink on dusty vintages with names like Chateau-St.-something and Dom-somebody. Not to mention all the times they'd used forged IDs, bribes, and age-enhancing makeup to flirt their way through the hottest clubs of Tenerife, Tokyo, and Pretoria. Yes, Kammi and Yomiko would be the best choices. She thought about adding some guys to the mix, but ultimately decided against it. Guys would want to drive the Hummer, and it was Trista's car—or soon would be. She didn't want to spend the whole trip arguing with a bunch of guys, cute or otherwise.

Trista, Kammi, and Yomiko hit the road in mid-afternoon on the day after Trista's birthday. She'd intended to leave earlier, but the opportunity for her first fully legal binge had left her with a hangover sufficient to make her reconsider the wisdom of ever drinking again. The hangover pills worked well enough, though, that the decibels didn't hurt too much when the big engine roared to life.

The curator of the museum had delivered the Hummer the day before, although at Trista's request it had been towed over, rather than driven. Other than whatever tests the mechanics had done, she really did want to be the first to drive the refurbished car. The curator had left it in the driveway with a cute pink bow on top that miraculously didn't clash with the yellow paint, then gave her a quick run-down on how to operate it. Happily, it wasn't all that different from the electrics she was accustomed to, except for a few quirks in the arrangement of the controls. "But take it easy," he'd warned. "The mechanics say it has a lot more power than you're used to. It'll drive out from under you if you're not careful."

Even with her wits dulled by the remnants of her hangover, Trista had no trouble remembering that warning. She'd told the mechanics she wanted the vehicle to sound as muscular as it looked, causing them to grin and mutter about mufflers. Now, she tapped the gas and the engine growled with barely contained power. This car wanted to go, and Trista was eager to go with it.

The plan was to drive northeast from the Spanish moss and camellias of Trista's winter estate, racing springtime up the Eastern seaboard and hitting the big cities to shop, dine, and sample the nightlife. But first, she wanted to show off her new-old toy somewhere closer to home.

She put the car in gear and peeled out of the driveway in an unintended shower of gravel, nearly hitting the gatepost on the way. The Hummer had seemed big when she'd stood beside it in the museum. Now it felt enormous, with fenders that extended forever. She tried to imagine the heyday of the automobile, when everybody drove things like this. Rhona would probably have told her that most people couldn't afford Hummers, but it was more fun to imagine the roads swarming with them.

Trista's estate was on the outskirts of town, and at first, the road was empty of everything except bicycles, scooters, and horses. She laid on the horn in what she thought would be a friendly toot, but the mechanics had evidently been toying with that, as well. The Hummer let loose with a blast like a freight locomotive and everyone scattered—a good thing because she still wasn't quite sure how much space she occupied. More

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horn toots cleared a path through town, where even the electrics and biofuel runabouts instantly made way for her. There was a brief problem when she rounded a corner and found herself face-to-face with a delivery truck: backing up with the trailer was a skill she'd not thought to practice. But she revved the motor menacingly, and the truck driver ran out of a store, took one look at the Hummer, and decided not to argue.

She then headed for the beach, where she raced down the strand at speeds no modern energy-miser could match. Then she swung a wide U and roared back, hub-deep in the water, spray arcing to the side, Kammi and Yomiko whooping as they reached in vain for the flying droplets.

When the trailer started slewing around, half-afloat, half-hydroplaning, Trista decided she'd pushed the envelope hard enough for one day. She steered back to shore and practiced backing up. It took an hour, and her friends were on the verge of mutiny when she finally pronounced herself satisfied. Trista had never before worked so intently at anything that didn't involve alcohol or parties, and Kammi was of the opinion that the horn had worked perfectly well the first time, so why bother.

Trista's neighbors weren't the only ones watching the start of her great adventure. Far overhead, a satellite network picked up the signature of unexpected gases. It was a deeply stealthed network—so deeply so that no human had ever caught even the briefest hint of its existence. Nor would they, if the AI that controlled it had any say in the matter.

Artificial intelligences aren't capable of becoming excited, but this one was capable of something akin to intense curiosity. It had been many years since it had seen anything remotely like the exhaust plume that had suddenly sprung up below, and in the interim, life on the planet had settled into a deep, uninteresting routine. AIs aren't capable of feeling useless, either, but this one knew it had been quite a while since it had given its masters new information to help with the choice that must soon be made.

The AI did not know what was producing the hydrocarbon plume—or why. Until it had the answers to both questions, it was too early to alert its masters. But while AIs aren't supposed to feel intuition, either, this one couldn't help but believe that one way or another, this strange power signature might end this stage of its long, lonely mission.

The drive north was an exercise in frustration. Shortly after leaving the beach, Trista tooted at a horse—and watched in astonishment as the beast cleared a shoulder-high fence, its rider clinging desperately to its mane. Had the same horse been pulling a cart, someone might have been seriously hurt. The word "responsibility" wasn't high on Trista's list, but she had no interest in killing people, either. She decided to be a bit more cautious around other traffic.

Other traffic was everywhere. She knew that air travel was a privilege few could afford, but she'd always thought that most people simply didn't travel, or dodged the energy tax by using trains. Sure, the cities were full of cars, but she'd not expected to find so much traffic between towns—all of it slow, slow, slow: no surprise when she thought about it, because simple physics said that the slower you went, the less the energy cost. Nor was driving through fields and pastures really an option. She told Kammi and Yomiko that she didn't want to scratch up the Hummer, but it had more to do with the look of panic on the rider of the leaping horse. Breaking down fences suddenly didn't seem all that entertaining.

It took two days to get to Charleston, another three to get to Baltimore, and two more to get from there to New

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York. The denser the population, the slower and less fun the Hummer was to drive.

Worse, Kammi and Yomiko wanted to spend *days* in each city. Even though Charleston's trendiest clubs didn't draw the super-chic clientele they'd find farther north, they spent three nights there, dancing, drinking rainbow-hued cocktails that changed color with each sip, and never waking before noon. Afternoons were occupied by hair and makeup or shopping for the next night's clubwear. It was exactly the type of holiday Trista had been taking since she was sixteen, but she had trouble getting into the swing of it because what she really wanted to do was *drive*. Turning twenty-one was supposed to be fun, but it was also supposed to be *different*.

In their spare moments, Kammi and Yomiko somehow managed to fill every nook and cranny of the Hummer with clothes, shoes, and expensive junk. Before Charleston, Trista had been able to pass slow vehicles on the grassy shoulder. The first time she tried that afterward, she hit a bump and something went *crunch-sproing* behind her. It turned out to be a guitar that had supposedly been played by one of the members of the legendary Quartermambas. Or maybe Beethoven or John Lennon. The store clerk had seemed to have several stories, with prices and authentication documents to match, but once he'd said "Quartermambas," Yomiko was in full-swoon mode and wouldn't hear anything else.

Now, Yomiko didn't speak to her for the rest of the day—which was better than Kammi's response, which was to endlessly repeat, "be careful" at every bump. The next morning, as they were checking out of a hotel in some town too small to have a decent club, Trista pulled rank and ordered her friends to ship everything they didn't intend to wear or eat back home, *now*.

The alien AI heard the crunch of the breaking guitar, but only vaguely understood why it left the three young women so irritated with each other. In the days since it had spotted the exhaust plume, it had identified the vehicle, discovered the gnat-cams, and reconfigured its sensors to tap into their ultra-low-energy telemetry. The results of its eavesdropping were not pleasing, for the women were of a type it had seen many times before: wastrels, now partying away the last of a type of fuel the AI had thought no longer existed. Its masters wouldn't be thrilled, but this was exactly the type of information they needed.

The last straw came in New York. In retrospect, Trista realized she should have just left the Hummer in Jersey and taken a cab. Manhattan was a nightmare. There were vehicles and pedestrians everywhere and most didn't pay any attention when she blew the horn. Those that did react didn't have anywhere out of the way to go, anyway.

By the time she found a parking garage big enough for the Hummer, she was thoroughly tired of hitting things. Thankfully, the trailer had taken the worst of the pounding, and the cheery-yellow Hummer still looked reasonably pristine. But that was more than she could say for a lamppost, two vehicles she'd clipped somewhere on Madison Avenue, and three cars in the parking garage. It had been bad enough hitting the first two cars, but then, at least, the drivers' tirades had abated when she gave them the com number of her trustee, who convinced them that she really would pay triple the cost if they'd just quit yelling at her. The parked cars were worse because she had the added hassle of first *finding* the drivers, *then* getting yelled at. After the first one, she was tempted when Kammi suggested that they just let the parked cars take care of themselves. But even though Trista knew she was too rich to go to jail for something as trivial as that, she

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couldn't quite bring herself to do it.

They arrived on a Tuesday, and the only thing Trista was sure of was that she didn't want to drive through the same kind of traffic on the way back out. That meant leaving on Sunday morning, and as far as Trista was concerned, there was no such thing as too early. But on Saturday night, Kammi and Yomiko snared invitations to a super-exclusive party loaded with vidcom stars, sports heroes, and musicians—a strange mix in which the only common links were fame, money, or both—and they were still going strong at 1:00 AM, when Trista called it a night. "Remember," she shouted in Kammi's ear, "early start."

But of course Kammi didn't stagger into their suite until sometime around 4:30 AM—Trista knew because she kept waking up every half hour, wondering if she needed to go drag her friends back to the hotel. Yomiko's door clicked shut a few minutes later.

Three hours after that, Kammi was out cold, flopped on her bed, shoes dropped in the doorway of her bedroom but otherwise still in her party clothes.

"Come on. Time to get going," Trista said, giving her a less-than-gentle shake. But there was no reaction, not even a grunt. Irritated and needing to pee, she stalked to the master bathroom, opened the door—and found a guy in the process of stepping into the shower stall.

The guy heard the door and turned to face her, nonchalantly pulling a towel from a rack and holding it sort-of in front of him in a move so strategically perfect he must have practiced it many times before. He was blond, mustached, and well enough built that he either spent hours a day working out or a fortune on muscle-enhancers. "Hi," he said, letting the towel drift slightly off-center.

He looked familiar, like someone she might have seen on the vidcom, and she had a vague recollection of maybe dancing with him once or twice last night. Horrified, she replayed her memory for blackouts, but she wasn't the type to bring a guy home and not remember it. Especially a guy who looked like this. Besides, she *knew* she'd limited herself to two drinks because she'd been really serious about getting an early start.

"My name's David," he said, the towel continuing to edge to the side. "And you are . . . ?"

"*Yomiko*," she breathed, and shut the door. She ran to the third bedroom. "*Yomiko*!"

Yomiko, at least, wasn't totally dead to the world, though she didn't miss by much. "Mrrmph," she said, trying to burrow away from the light, but Trista was having none of it. "Who *is* that guy?"

"Met 'im at the club," Yomiko mumbled. "Coming with us. Isn't he wonderful? He plays football. And he loves me. G'nite."

Mr. David Football-player-wonderful was now in the living room, sipping orange juice from the mini-bar, still playing peek-a-boo with the towel. Furious, Trista grabbed a terry-cloth robe and threw it at him. "No," she said, meaning the word in every possible way. *No* to his obvious intent; *no* to guys on the trip, especially one who'd make passes at her and Kammi every day until Yomiko wised up; *no* to the whole stupid trip. And of course all of this also spelled *no* to leaving on Sunday.

That afternoon, they thrashed it out. Kammi was going to spend a few more weeks in New York. Trista was welcome to join her, especially if she'd just relax and get back into the party spirit. Yomiko was taking David to Reykjavik. The next plane was leaving tomorrow evening, and everyone knew the nightlife in Reykjavik was among the finest in the Northern Hemisphere. The Icelanders were blessed with a low population and lots of geothermal energy, which they'd parlayed into one of the world's highest per-capita incomes and a party scene to match. There were weekly flights not only from New York, but

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also from most of the major capitols of Europe, and they had so much energy that they used steam tunnels to melt the snow off the streets, a profligacy that had awed even Trista when she'd once been there for Christmas.

If Yomiko had invited Trista to join her, she might have been tempted. But Yomiko didn't—an indicator that she was probably beginning to figure out that David needed to be kept away from other women. Trista couldn't think of a kind way to tell her that she'd better guard the return ticket or she'd just lose him to some Icelandic beauty once they got there.

The orbiting AI understood sex well enough, although it didn't particularly care about the outcome. What mattered was that two of the women had already fallen back into established patterns. When the third one did the same, it would be final proof that the planet had produced yet another evolutionary dead-end. The AI's masters were patient, but only in the very long run. In the short run, there would soon be a good opportunity to nudge a small asteroid into a slightly different orbit. If the AI did it just right, it could hit the deep water near Hawaii, where the Earth's next ruling species might not be quite as quick to pick up the traces as the humans had been to find signs of the one it had dropped on a prior evolutionary dead end, sixty-five million years before.

Trista agreed to be part of Yomiko and David's final night on the town, but her heart wasn't in it. The entire trip had been a bad idea. The best part had been splashing through the surf, with second place going to the first time she'd gotten the trailer to back up in a straight line. From then on, it had all been downhill. But she didn't want to stay in New York for Kammi's endless party, either.

Listening to the band and sipping a drink she didn't want, she wondered what was wrong with her. Here she was, only days past her birthday and already tired of the party scene. Yomiko had come of age months ago, and Kammi was nearly twenty-four, but neither of them were burned out.

She thought about the dented-up Hummer in the garage. What would happen if she just left it there? She could charter a jet or a 'copter and be home by noon tomorrow.

Almost without knowing how it happened, she found herself in the relative quiet of the bathroom, com to her ear, starting to place the call that would wake her trustee and ask him to arrange the charter. Then she paused, remembering how many problems she'd solved this way. The poor man was always patient, always efficient, always calm—even when she yanked him from a sound sleep for some trivial errand that could equally well be done in the morning: an errand she herself could do easily enough if she ever bothered to learn how. She cancelled the call. She didn't have to be home by noon. Dinnertime would be fine. For once she'd let him rest.

But the com was still in her hand, and she really needed to talk. She checked the time, then rationalized that (a) this call was different; and (b) she was now calling a com that might be in any time zone in the world.

Wherever Rhona was, she was still awake. "Well, what did you think was going to happen, driving that monstrous rig through all those cities?" she said, when Trista finished voicing her frustrations.

"So what should I have done?" Trista asked, realizing she was already thinking of the trip in the past tense.

Rhona picked that up, too. "What's this 'should have' stuff? How much of that gasoline do you have left?"

Trista shrugged, but it was a voice-only com, so of course Rhona couldn't tell. "Most of it. Maybe thirty-five hundred liters."

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Rhona paused, and Trista presumed she was chasing down some arcane datum on the Net. "Gads," she said. "Even with an inefficient rig like that, you've still got enough to go all the way across the country. And then some."

"Why would I want to do that?"

"Because that's what road trips were all about! Doing something you've never done before. Or in this case, something *nobody* does anymore. Who do you know who's driven across the country?"

The answer, obviously, was no one. If you could afford the fuel and the energy tax for a trip like that, you flew. If you couldn't, you took the train. Driving was the worst of both worlds—maybe not as expensive as flying, but a heck of a lot slower than the train. Driving that far would take *months*.

"Maybe not that long," Rhona said. "Where are you staying? I'm not doing anything here. Do you still want to try a *real* adventure?"

With the choice put that way, Trista wasn't about to refuse. Two days later, Rhona was in New York, sleeping in the room Yomiko had vacated and jabbering about tents, sleeping bags, and meals-ready-to-eat. "The trick with a rig like this," she said, having presumably gleaned her information from ancient travel guides, "is to keep away from cities. That means we need to be self-sufficient, in case we wind up where there isn't even a decent B&B." For the next several days, they shopped: not for clothing or jewelry or anything Trista knew how to shop for, but for what Rhona called *road supplies*. By the time she was finished, the Hummer was nearly as crammed as it had been the day it left Charleston. Trista didn't even know what half of it was, but Rhona assured her it would all be useful. Or at least that it might be. There was, she admitted, a difficult line between being prepared and being over-prepared.

In the meantime, Trista (shoving aside the impulse to call her trustee, but still having to rely heavily on the concierge) located a contractor who, for a price, came to the garage and pounded the dents out of the Hummer, painted away the scratches, and restored it so that, if she didn't look too closely, it was nearly as pretty as it had been, parked in the driveway with the bow on top.

By the following Sunday, all was ready. They rolled out of Manhattan at dawn, having left a good-bye note for Kammi, who had yet to return from wherever it was she'd gone on Saturday night. The city wasn't quite as dead as Trista hoped, but she escaped without any more collisions, and somewhat by default, she and Rhona set their sights on San Francisco.

For the first part of the trip, they were definitely over-prepared. Their route was meandering, dodging anything even remotely resembling a city in favor of an endless string of historical sites, quirky inns, and rustic scenery. It was even slower than the trip up the Atlantic coast, and some of the accommodations were a bit too quirky for women who'd never before experienced anything but the best, but the slower they went, the more fun it was. As their route wandered from the Appalachians to the prairies and then to the Rocky Mountains, Trista thought that were it not for the very real limitations of her fuel supply, she might be able to live like this for a long time.

While Trista and Rhona were buying supplies, the AI filed a lengthy report with its masters. The reply was short and to the point: INFORMATION RECEIVED. PROCEED AS NECESSARY. That was the closest its masters would ever come to saying that they too were ready to give up on the humans. They were leaving the final decision to the AI and authorizing it to use its own judgment.

Once the intervention was complete, the AI would hunker down, pulling in all but a few expendable sensors. It could not stay sane if it tried to remain awake for millions of years, so, as it

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had done before, it would schedule mini-wakeups in which it would look around and make sure it wasn't missing anything important.

Soon, the AI must either nudge the asteroid or wait for another opportunity. It was nearly ready to proceed, but it had never before killed a sentient species, and the authorization to proceed as necessary included the autonomy not to act. The hydrocarbon plume was still moving. Although wasting the final remnants of its fossil fuel epitomized everything else this race had done wrong, the third young woman represented unfinished business, and the AI was nothing if not thorough.

One day on the sere plains of northern Nevada, Trista found herself facing the prospect of having no decent place to spend the night. For hours, she had been driving the old interstate highway, now displaced as the main thoroughfare by the rail line, resurgent from the days in which the highway itself had once displaced the rail. This stretch of road was in particularly bad repair and the Hummer was banging through endless potholes and threatening to wreck the trailer anytime Trista pushed the pace beyond thirty klicks per hour.

Trista did not want to spend the night in one of the dreary casino towns that dotted the nearby rail line like gaudy bulbs on a string of cheap Christmas lights. Camping would be preferable, if only there was somewhere to camp. The first time she and Rhona had broken out the camping equipment, she'd found the experience to be almost unbelievably primitive, but fun once she got over the initial shock. But that had been in a manicured park somewhere in Kentucky, where redbud scented the air and dogwood decorated the hills. Nevada, she grumbled between potholes, was nothing but ugly scrub.

"Not so," said Rhona, with that faraway look that meant she was linked. "You just have to know where to go." She hesitated, accessing. "Take the next exit."

That put them on a series of dirt and decaying asphalt roads that were even slower than the interstate but a lot more interesting. Shortly before sunset, Rhona guided them to a kilometer-deep canyon, where a river of ice had once spilled out of the mountains, far into the basin beyond.

Two kilometers up canyon, they encountered a snow gate and a sign proclaiming the road to be closed until spring.

"Damn," said Rhona. "That wasn't in the guidebook."

"And what exactly will they do to us if we ignore it?" Trista asked. Rhona got that faraway look again, and Trista nudged her. "Rhetorical question." She thought briefly about ramming the gate—somehow, breaking down government property to avoid some stupid regulation didn't seem as bad as running through farm fences to avoid slow cars—but there was a simpler solution. Unhitching the trailer in a pullout, she topped off the gas tank and drove around the gate, crunching through the crusty snow. It was time to put Rhona's over-preparations to the test.

Rhona was clutching the armrest and saying something about ditches, but Trista remembered how it had felt, driving through the surf on the ragged edge of control. *This* was what the Hummer had been built to do.

They drove all the way to the end of the road and then some, eventually reaching a frozen lake at the base of a high cirque. Trista wanted to drive onto the ice, but Rhona persuaded her that that might be a truly bad idea, so they camped beside it. The snow was deep and cold, but the tent was snug, the sleeping bags warm, and Rhona's preparations had even included a little space heater that ran off biofuel and was guaranteed not to asphyxiate you or set the tent on fire. In the morning, they crunched back out over the snow, leav-

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ing early enough to be back on the road before the sun turned it to greasy slush.

Trista was now on a mission. The Hummer was probably the only vehicle on the planet that could have made it to that lake and returned intact, and she and Rhona were the last people who had a chance to find out what else it could do. Forget the freeway. Forget San Francisco. From now on, they were on the backloads, and the backer the better, with Rhona filling their wilderness camps with tales of fur trappers, miners, and the Pony Express.

A few nights later, Rhona guided them across a shimmering salt flat two thousand meters below a ridge of snow-capped peaks. "Don't get too close to the lake," she said, nearly too late, as Trista, reveling in the smooth, flat surface, hit a slick spot at a hundred klicks per hour and nearly ended their journey in a jackknife.

The fat tires and four-wheel-drive barely pulled them out of the mud, and after that, Trista gave the lake a respectful berth until she reached the base of a 300-meter ridge on the far side. "Camp up there?" she said, gunning the motor, preparatory to charging up a sand-slope that spilled ramp-like from one of the few breaks in the band of dark rocks crowning the ridge.

"No," said Rhona in a tone Trista was coming to respect. "Sand is even worse than mud. We have to walk."

Trista stared at the ridge, which suddenly looked a whole lot bigger. "All the way up that?" The past few days had made her bolder—on the edge of being too bold, she'd realized a few minutes ago, sliding through the mud. But her boldness had been yoked to the Hummer and its beat-anything engine. She wasn't exactly flabby, but she'd never walked in anything wilder than a city park, either.

"Why not?" Rhona said. "It can't be more than a couple of klicks, and I bet there's a hell of a view from the top." She paused. "Remember the Pony Express."

Lugging the tent, heater, and sleeping bags through the sand was a first-class bitch—enough so that Trista found it hard to believe when Rhona said that millions of people used to drive to such places simply to hike, back in the days when energy was cheap. "Of course," Rhona added, "they had backpacks and decent shoes." But eventually she reached the top, none the worse for wear except for a ruined pair of Italian pumps, a twinge in her knee, and a few nasty scuffs on her now-very-uncomfortable Parisian jeans.

"Wow," Rhona said, so softly that Trista barely heard.

Their ridge was actually a circular plateau of jet-black basalt, barely larger than the estate where Trista had grown up. If the navel of the world was an outie, this was it. Below, the Hummer was a dot on the edge of the playa. Late-afternoon sun glinted off the water behind it, while the mountains stretched for dozens of klicks in an unbroken escarpment. In the opposite direction was another playa, smaller than the first and minus the lake, but probably just as muddy to drive across, if even the Hummer could get there. A jumble of rugged hills rose nearby, while in all other directions, more mountains etched snow against pale blue sky.

"Trout Creeks, Pueblos, Jacksons, Sheepheads, Pine Forest Range . . ." Rhona was reciting from an internal map, but Trista was too awestruck to care what anything was called. She sat on a rock and for the next hour said nothing as she studied the emptiness spread out before her. Without the ever-present roar of the Hummer, the silence was as unearthly as the view, and it touched something within her, something for which she had no name.

Sunset roused her with its sudden chill. Already shivering, she scooped up

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the tent and started to pull it from its bag, only to be stopped by Rhona.

"Let's sleep under the stars," Rhona said.

"Huh?"

"You know, without the tent."

Trista had barely heard of tents before she and Rhona bought this one. The idea of sleeping without it was extremely disconcerting. "What about bears?"

Rhona chuckled. She was acting like an old hand at this, but Trista was sure she'd already checked it out on the Net. "This isn't bear country. Besides, do you think a few microns of fabric would actually stop a bear?"

Trista was sure it wouldn't, but the cocoon-like protection of the tent was one of those illusions she'd rather not shatter. "What about mosquitoes?"

"In the desert? When it's this cold? No way." Trista knew the next line before it came: "Pony Express."

Screw the Pony Express, she started to say. *Half of them were probably eaten by bears.* But it certainly wasn't going to rain, and she'd not seen a mosquito all trip. What other nasties might be out there? Wolves? Scorpions? Fire ants? She didn't ask because Rhona might know. Besides, the odd sense of somethingness she'd felt on the rock was still with her, and her boldness was returning, bolstered by confidence that if there really was anything dangerous out here, Rhona would have found it on the Net.

The danger, though, was overhead.

The AI's masters represented an alliance of species scattered throughout the galaxy and maybe beyond, and the AI was one of many probes they had created to monitor planets that might produce races worthy of someday joining their far-flung league. The probes were also equipped to jolt planets out of time-wasting dead ends, because dead ends were often very, very stable. Human biologists would have recognized this as an application of an evolutionary theory called punctuated equilibrium. What they did not realize was that the AI occasionally acted as a dramatic, not-so-natural exclamation point.

A few days earlier, it had decided that an asteroid alone might not be sufficient to do the job. Not only were humans likely to be more resilient than the dinosaurs, but the best evolutionary restarts were usually the result of double whammies, such as dropping a rock on a world whose ecology was already weakened by massive volcanic eruptions.

Rather than waiting for natural assistance, the AI planned to engineer a plague. The difficult question was whether to limit it to humans, or to target primates of all types. Eventually, it decided to exterminate them all. Perhaps then the AI would awaken to a world of avians, or of hive-minded insects. Perhaps cetaceans would finally develop limbs to put those big brains to use. Or maybe the planet would be inherited by something truly weird, like giant telepathic slugs.

Trista and Rhona placed the space heater between them, only to discover that it didn't have the power to warm the entire outdoors: more weight which, like the tent, might as well have been left in the Hummer. Oh well, live and learn. Trista pulled the tab on a heat-in-the-package meal and hunched over to eat it, already swaddled in her sleeping bag. And she'd thought it was cold up by that lake. Forget wolves and scorpions; tents were for *warmth*.

But as the sky darkened, she forgot about freezing to death. By chance, it was a new Moon, in a high desert that had long offered some of the darkest nights on the continent.

"Look at that," Rhona said, and for once she seemed entirely in the here-and-now. "Hundreds and hundreds of square klicks and not a light anywhere. Do you think there's anyone out there?"

But Trista's eyes were for the light-

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show above her. Somewhere, during a short but intense episode when she was fascinated by science, she'd read that there were only a few thousand visible stars. But there seemed to be millions, gleaming at her from all sides. Living in cities, vacationing in swank cottages by the lake, she'd seen stars before, but never anything like this—never even imagined anything like it. Once upon a time, she knew, people had ventured into that darkness. They'd walked the moon and driven remote-piloted rovers down the ancient streambeds of Mars. They had lived, sometimes for years, aboard orbiting space stations. And then, slowly, they had withdrawn. The energy price had been too much.

She tried to imagine what it would have been like up there. A lot like this, she decided, trying to warm her hands over the space heater without letting drafts into her sleeping bag: a mix of the primitive and the high-tech, except you'd have to know a lot more about what you were doing before you tried it because *live* might not always be part of *live-and-learn*.

One of the stars was moving. At first she thought her eyes were deceiving her but then, happy not to have had to ask Rhona, she realized it was a satellite.

Humans hadn't completely withdrawn from space. When Trista was very young, her first trustee, an old man who walked with a stoop and harangued her about taking advantage of life's "broadening experiences" whenever she could, had taken her to a launch where they'd waited a long time before the rocket finally rose on a needle of flame like a hundred private jets all firing at once. Then he'd died and nobody else cared what she did, so she discovered parties and makeup and wine and hadn't even thought of the satellite launch for years, though of course satellites were tools she used without thinking about them every time she answered the com.

She'd never before seen one in the sky. Still cold, but no longer caring, she watched it slide all the way across, until it vanished behind the prow of one of the hills to the north.

The AI hadn't forgotten Trista and Rhona. In the clear, transparent air of the high desert, its sensors watched from above as the space heater formed a bright infrared flare, while nearby, the self-heating dinner produced its own lesser signature. The AI had honed its ability to eavesdrop on the gnat-cams' telemetry until now the reception was so good it could see that the one called Trista was gazing at something. It watched her eyes track across the sky long enough to determine that she was seeing a satellite—not one of its own, for those had no shiny surfaces to catch the Sun—but a human instrument, built for billions of com customers.

The satellite was in many ways a wonder of technology, but it was also a sign that this civilization had reached a dead end.

Unlike the dinosaurs, which had had tremendous potential but never quite managed to develop intelligence, the humans initially had everything the AI's masters wanted. They'd even begun expanding through their solar system at a rate that would have allowed contact within a thousand or so of their years. But they'd squandered resources on things like the ancient Hummer, things that had too quickly drunk dry their once-abundant energy reserves, even as their numbers continued to multiply beyond reason, stretching their remaining resources ever more thinly. Now, their satellites were lightweight, multiplexed objects, few in number and lifted by rockets which, however spectacular they might look from the ground, were minuscule compared to those they'd once had.

Among the AI's masters were xenologists who might argue that the humans had stumbled too quickly on miniaturization and nanotechnology—fields that had allowed them to pursue a

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high-tech lifestyle without really coming to grips with their declining energy reserves until too late. The results were ingenious, but also a trap that had left them planetbound except for trifling devices like the satellite now passing overhead.

More than any other resource, energy had been the key. There was abundant energy in space, but it took a large energy investment for a race to get there in sufficient numbers to take advantage of it. Now, although the humans had sufficient renewable energy to restart their space program if they wanted it badly enough, they showed no signs of making another attempt. Like their rockets, their civilization had lost its fire and was geared solely toward keeping twenty billion people alive and in reasonable comfort, with extra luxuries for those who could afford them. To the AI, this made them boring. To its masters it made them children who had never grown up: mildly interesting to the xenologists, but unlikely ever to be worthy of admission to their confederacy.

The woman called Trista represented the human race in microcosm. That, the AI had realized some time ago, was what its pseudo-intuition had been trying to say when it first spotted the exhaust plume. Soon, the last of the fuel bequeathed by the dinosaurs and their predecessors would be gone. Soon, she would go back to squandering other resources with her rich friends, while the rest of her world eked out its barely sustainable living. Then, the AI would do its job, go to sleep, and hope that nature served up something better, next time.

It had waited far too long before giving up on the dinosaurs. It wouldn't make the same mistake with the humans.

In the morning, Trista learned what kind of wildlife frequented the Great Basin steppes. The emptiness of space had affected her as strongly as the emptiness of the surrounding landscape had affected Rhona, and she'd been slow to fall asleep. Then, she'd slept fitfully until a few hours before dawn, when a fingernail-clipping Moon waged a surprisingly successful war against the surrounding darkness.

By dawn, she was dreaming of red hills and flood-carved valleys where water no longer ran, of a sky with two tiny moons and a too-small sun, when her awareness was invaded by a strange clattering. At first, she incorporated the sound into her dream as rocks falling from the desiccated cliffs of Mars. But when she opened her eyes, she was surrounded by sagebrush, with Rhona softly snoring nearby.

The clattering continued. With a stab of adrenaline, she sat up . . . and found herself staring at a horse. A wild horse, she knew, without having to ask Rhona. Out here, any horse had to be wild because the energy cost of living this far from a rail line was simply too high to justify whatever meager income you could make from this—the analogy came to her, unbidden—Mars-desolate land.

To the horse, Trista in her sleeping bag must have looked like a gigantic caterpillar rising from the sage. It whinnied, reared, and was gone in a flash, disappearing below the plateau rim through a break on its far side.

Rhona stirred but did not awaken. *City girl*, Trista thought. *Used to the comforts of home, and sure that nothing can hurt her.* Not that Trista wasn't herself a city girl, but it was the first time she'd ever considered that she might have attributes that Net-assisted Rhona might lack.

Leaving the playa, they turned south, planning to desert hop as far that direction as their remaining fuel would carry them. But first they pulled into Winnemucca to restock on food. While they were at it, they bought boots, walking sticks, the best rucksacks they could

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find, and better attire than what they'd worn to their campsite atop the lava mesa.

Long ago, Winnemucca had been a mining town, a cow town, and a pit stop on the interstate that Trista and Rhona had abandoned a week before. Now it was the fanciest of the rail-fed casino towns. Downtown was tidy parkland surrounding a postcard-perfect rail station, but on the outskirts, ranks of blue-black solar collectors gathered power to feed the tourist economy. *Can't let the lights go out on the customers*, Trista thought, realizing that only a few weeks ago, she'd have been among those who'd have thought it absolutely dreadful to have anything but perfect heat and lighting, wherever she went. Nothing like sleeping on a cold, dark mesa top to change your view of what you really needed.

But the incongruity ran deeper than that.

"Why isn't this entire state one big solar collector?" she asked. Other than the banks of collectors that sold power to the casino, Trista realized, all that she'd seen had been the usual assortment of business-district power grids, rooftop water heaters, and solar nets for short-range electric cars. There had also been a few wind farms in the passes, and transmission lines that spoke of more distant power facilities, but mostly, this land belonged to the desert.

"Good question," Rhona said. "There's certainly enough sunshine."

Trista waited, while Rhona did her research.

"Got it," she said a few moments later. "They tried it back in the twenty-first century, but it didn't work. Something called the 'heat island' effect. Or maybe a 'cold island.' The literature's a bit inconsistent, and they *were* sucking a lot of power out, so it might have been energy drain, not waste heat that created the imbalance—"

"Whoa." When Rhona found something interesting on the Net, she sometimes forgot that she was the only one privy to the data flashing through her head. "Speak English."

"Sorry." Rhona paused to organize her thoughts. "Sometime in the 2160s, they built a huge installation in the Bootheel region of New Mexico—that's the section that sticks down to Mexico, between Texas and Arizona. I'm not sure how big it was, but it covered hundreds of square klicks. At first, it worked great, but all those solar collectors altered the way the land heats up in the sun." She paused again. "The result was the mother of all thunderstorms. Hundred-mile-an-hour winds—gads, that's 160 klicks. Big hunks ripped out of the array. Then the storm moved on to El Paso, where tornadoes killed something like 1,500 people. No wonder they never tried it again. And just think of all those lawsuits."

"Yeah," Trista said. Something else was nagging at the back of her mind. "So why didn't they just take it into space?" Who had told her about such things? The stooped old man? It must have been someone she knew when she was young, because it would never have caught her attention later on. Perhaps last night's satellite had brought it back to mind. Or maybe that weird dream of Mars.

"There was talk of it," Rhona said, after another link-pause. "But nobody wanted another gazillion-dollar boondoggle. Then, everything started going small-scale."

If the AI had had a list of subjects it did not expect to hear the two women talking about, power satellites would have had to be near the top. Now, as it watched the one called Rhona pull information from the Net, it realized it had been overlooking an important source of data.

Tapping into Rhona's Net link proved more difficult than eavesdropping on the gnat-cams. The transmissions were brief, intermittent, and well shielded

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from human spying. Nevertheless, each time Rhona used her link, particularly in isolated regions where there were no complications from coms or other sorts of links, the AI came closer to cracking it.

Success, when it arrived, did not give it direct access to Rhona's mind. It was more like standing behind her in a library, looking over her shoulder. Mostly, what the AI found was something that was already obvious: Rhona loved information. She was capable of becoming passionate about nearly any subject, but her data-calls flashed through the Net with a stream-of-consciousness logic that defied analysis. Perhaps that was the inevitable result of a civilization that had reached a cul-de-sac in which everything was writ small. Rhona was a spark plug in a world with no fuel to ignite.

The Humvee finally sputtered out of gas near a place called Hole-in-the-Rock, on the red-rock plateaus of southern Utah. Trista was moving just fast enough when it happened that she was able to coast off the road before she lost momentum, although, from the looks of things, it was unlikely that another vehicle would demand the right-of-way in the near future.

"Well," she said into the ensuing silence, "that was fun while it lasted." The words hung like an obituary for the trip, or the Hummer, or the civilization that created it, combined with a what-do-I-do-now curse for the life that stretched ahead.

She sat for a moment, then pulled the com from the glove box, grabbed a water bottle, and started walking down the road, Rhona trotting to catch up. "Before we do anything else, let's go find this Hole-in-the-Rock," she said. "If the odometer's right, it can't be more than three or four klicks."

It was avoidance behavior, and she knew it. But then, this entire last day had been avoidance behavior: pretending that the inevitable wouldn't actually happen. A couple of days earlier, they'd filled the Hummer's gas tank for the last time and given the trailer to a rancher who thought he might find use for it. Southern Utah was tourist country, and they were looking for one final, off-the-beaten-path destination when they spotted the sign for Hole-in-the-Rock at a rough turnoff from the main road where, starting next weekend, tourists would ride trams, buses, and rental electrics through some of the Southwest's most colorful terrain. Until then, Trista and Rhona had the entire region to themselves.

"Don't check it out on the Net," Trista had suggested. "Let's just go, and find out for ourselves."

But when they trudged over the last rocky rise, Trista was disappointed. Hole-in-the-Rock proved to be exactly that: a narrow notch cut in red rimrock atop a several-hundred-meter-deep canyon at the junction of two rivers, the bigger of which she knew to be the Colorado. The view was nice, but she and Rhona had seen better, and it seemed an anticlimactic end to their long adventure. "Okay," she said. "Maybe we should have checked it out before we drove all the way out here. What is this place?"

Rhona correctly read that as an invitation to hit the Net. "It's an historical site," she said a moment later. "In 1879, a guy named John Taylor asked a bunch of people to go from somewhere back that way"—she gestured in the direction from which they had come—"to build farms somewhere over there"—she waved toward the far side of the river. "When they got here, they couldn't find a way down. They didn't want to quit, so they whacked this notch through the caprock, lowered their wagons down to the river, and headed off over some even rougher terrain on the other side." She paused. "It was only two hundred klicks but it took six months."

Trista walked to the rim of the canyon

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and sat on the edge, sipping at the water bottle. Rhona joined her, and Trista passed her the water, but said nothing, trying to imagine all of those people, determined not to give up, chipping away at the sandstone until eventually it allowed them passage.

Two months ago, shortly after they'd left New York, Rhona had guided them to a Civil War battlefield called Gettysburg. Things military had never particularly interested her, but touring the battlefield, it was impossible not to be moved by the events that had transpired there—the hopeless bravery of Pickett's charge, the desperate fighting at Little Round Top, where a handful of soldiers held fast when failure might have cost the Union the war and made Trista's own life unimaginably different. In the chill, misty days of barely spring, it had felt as though the very ground was charged with the passion and sacrifice poured out there, that even if humanity forgot, the Earth never would. Now, in the hot almost-summer of the Utah desert, she felt a similar haunting—not of death and bloodshed, but of purpose and commitment. She supposed that if you looked deeply enough in history you could find such memories everywhere, but it seemed ironic that her true adventure—the one that had begun with Rhona—was bracketed by two of them.

Sitting in the desert sun was thirsty business, and far too soon, the water bottle ran low. "Well," Rhona said, "time to go home."

"Yeah." But Trista made no move to activate her com. She had always presumed that when the trip ended, she would simply call home and have someone send a 'copter. Or, if for some reason the com wasn't working, she'd let the gnat-cams scream for help. But now that seemed worse than anticlimactic: it felt like spitting in the face of the spirits that haunted both this place and Gettysburg.

Had the Trista of only a few weeks before looked in a mirror and seen the person now sitting on the canyon rim, she might not have recognized her. The socialite hair was a windblown mess, the carefully tended complexion tanned and desiccated. Her shoulders and legs were starting to show muscles from all the times she and Rhona had lugged food, water, and camping gear to lofty vantage points. But the biggest change was in her demeanor. There was a strength to it that had never been there before. When they left New York, Rhona had been the leader. But ever since she slewed the Hummer around that snow gate in northern Nevada, Trista had started feeling the need to push herself ever farther beyond her normal comfort zone. She wasn't sure what it meant, but now it was Rhona who deferred to her and it had nothing to do with who owned the car.

Unfortunately, she didn't know what to do about the 'copter. Everything about this journey had awakened her to the extravagance of the life she'd always taken for granted. 'Copters and private jets *drank* fuel. Over the years, she'd probably used more than enough high-grade energy to launch that satellite she'd seen as a child. And what did she have to show for it but a succession of hangovers and more clothes than anyone could ever use?

Roaring around the country in the Hummer had also been extravagant, but at least the gasoline had been a relic that probably didn't have much real use in today's world—although sometime or other, someone was going to have to burn a bunch of real, modern-day fuel to get the Hummer back to its museum. That was something Trista wished she'd thought of before leaving the main highway, but there wasn't much she could do about it now. Maybe she could find a chemist who could whip up some special biofuel that wouldn't wreck the engine between here and the nearest railhead. Then she could send someone back for the vehicle, by horse or scooter or whatever else could get down that road. At

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the moment, though, what really mattered was not blowing thousands of liters of 'copter fuel just to get herself and Rhona out of here.

"Any other options?" she asked, having explained this to Rhona.

"I wouldn't particularly recommend waiting for someone to come along. It might be a while."

Trista fingered her com. "What about walking?"

Rhona shot her a glance. "You've got to be kidding. It's seventy klicks back to the main road, and there's no water anywhere. Besides, what would we do when we got there? Those tourist trams don't start running until this weekend."

"I didn't necessarily mean going out the way we came in," Trista said. "We've got plenty of food, and"—she gestured toward the canyon—"there's lots of water down there." She waited while Rhona linked, then grinned as a smile spread across her friend's face.

"Yes," Rhona said. Her hand waved aimlessly as she traced an imaginary map. "*Great* idea." She looked up, as though from a mental book. "Assuming I can actually find that water purifier I bought back in New York." Then she was back to studying her invisible map. "All we have to do is hike up the smaller river. Sometimes we'll have to wade, but I just found an old guidebook that says it's never deep. It should be easy. People used to hire shuttles and do it all the time. Eighty klicks upstream, the river crosses the main road, and by the time we get there, the trams should be running . . ."

Trista wasn't the only one who wouldn't have recognized the person she had become. As the AI watched her and Rhona carry packs through the Hole-in-the-Rock notch, it knew that in part, their decision was motivated by the simple desire to keep the adventure going. But it was more than that, more even than awakening social consciousness. The woman who had nearly ended the trip in New York would never have set off on a weeklong hike, let alone one with only the supplies she could carry. Trista had found something that had always been rare and was now nearly nonexistent. She had found the soul of an explorer.

But that alone wouldn't be enough.

For a long time by computer standards, the AI reexamined its instructions. Its core programming was clear, but against that lay the order to proceed as necessary.

The core programming prohibited it from revealing itself to an emerging species. Long ago, its masters had learned that they could not force a race to mature by rushing too quickly into contact. If they did, the inevitable result was a parody of their own civilization, no more interesting than what they could have obtained simply by seizing the world and colonizing it. The AI's masters did not want clones of themselves. What they prized above all else was diversity.

Trista's metamorphosis had convinced the AI that at least one human still had the traits its masters were seeking. Wealthier than some governments, Trista also had the resources to bring any dream to fruition. But she was still the product of a culture that had long ago turned in on itself. She could spend the rest of her life as a prophet without a vision—an asteroid awaiting its nudge.

The real asteroid was safe in its orbit. The moment Trista declined to call a 'copter, she had won her world a reprieve. Appearances to the contrary, she had not wasted the gasoline. However accidentally, she had invested it in herself, in a manner that few if any of her peers could have duplicated. The question the AI now struggled with was new: did its authorization to proceed as necessary allow it to give her the nudge she needed in order to capitalize on that investment?

The answer appeared to be no. Had

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the AI's masters intended to override its basic programming, they would have done so more directly. Then it asked itself the question Trista had asked Rhona. Were there other options? And this time, the answer was yes.

One of the things humans had done in the waning days of spaceflight was to design ever-more-efficient rocket engines. Most had never gone beyond the back-of-the-envelope stage because money was drying up and everyone equated "new project" with "cost overrun." But some would work with only minor hitches, and several were far cheaper than anything that had actually been attempted. Trista could easily afford any of them.

What she would do if she knew of these old engineering schemes was an open question. She might ignore them. She might view them as private toys, like the Hummer. Or she might begin a new era of exploration, a self-perpetuating process in which her people would launch themselves back onto a path that would someday make them worthy of contact. Her choice would determine whether humanity's reprieve was temporary or permanent, but that wasn't something the AI could control without violating its programming. What it could do was to bring these designs to Trista's attention because they were, after all, human creations. In the process, the AI might also be able to find her some help in working through the practicalities that always lie between dream and reality.

The key was Rhona, with her love of anything she found on the Net. She was far more useful than the AI had thought. All that was necessary was for her to "accidentally" find one of those old designs.

Halfway into the canyon, Trista suggested that Rhona check the Net one more time, just to make sure she had the route memorized. In the narrow canyon, the link might be problematic, and Trista was learning to ask questions before she got in trouble, rather than afterward.

"No problem," Rhona said a moment later. "It's just a matter of walking upriver. We can't possibly go the wrong way."

For the next few minutes, they walked in silence, as Trista settled into the rhythm of the hike, assuming that Rhona was doing the same. But she should have known that her friend would take maximum advantage of the link while she still had it.

"Hey," Rhona said a few minutes later, "I just read something that gave me this truly amazing idea, if you're looking for something to do when we get home. I'm not sure your trustee would like it, but you *are* twenty-one, so it really would be your choice . . ." ■

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Mop-Up

Grey Rollins

Job qualifications are important, but not always obvious.

Brian Feston, chairman of the human delegation, stood by the door of the committee room, his attire immaculate even at such a late hour. As each member of the Nolroy entourage passed, he briefly touched their jagged, slate-colored scales. *"Tonika lan boon,"* he said to each of the eleven members of the delegation as they left for the night.

The Nolroy lumbered slowly, clumsily down the sweeping marble steps to the floor of the rotunda. Feston stood at the railing and watched from above as they left the building. When the last furrowed gray back had passed through the enormous double doors below, he permitted himself a slow, deep breath. He then reentered the meeting room to begin the meeting-after-the-meeting.

"Well?" prompted Feston, his eyes traveling from one to another of his human colleagues.

"We may actually be making progress," Vincent Donaldson offered as he took his seat.

"Progress? *What* progress?" Feston asked with no small amount of asperity. "All I heard tonight was the same old clichés. Did I miss something?"

"Oh, it's not as though we have any concrete results to point to, but I think we're on the verge of a breakthrough. I really do."

Feston narrowed his eyes. "Is that what I'm supposed to tell the president? That we *might* be on the verge of a breakthrough? May I remind you that this is an election year, and that the president needs something more substantive than the same stale report that I've been giving him for the last four months?" He directed his gaze at Elizabeth Banks. "How about you, Liz, did you get anything out of Blanso?"

She shook her head, her gaze dropping. "No. Sorry."

"Michael? How about Tranis?"

"No."

"Vincent?"

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"Uh, well, no. Nothing solid."

"Tom?"

Another head shake, this time with no words.

A sound between a groan and a growl escaped him. "People, we are here to negotiate the opening of diplomatic relations between the Nolroy and the people of Earth. This is the most important political and historical development of the last century . . . hell, in all of human history. Let's pretend for the moment that there are no domestic political implications. Let's pretend that there are no economic, social, or scientific repercussions. Let's pretend that it's nothing important . . . *only* the first human contact with an alien species." He pounded the meeting table with his fist. "Dammit, we're talking something more profound than Columbus opening the Americas to colonization. This is a—"

Michael Yaspers said, "Brian, I would like to remind you that some of us have mixed feelings about the European colonization. Particularly those of us whose progenitors were brought over as cargo from Africa. That said, we are well aware that this is an historic occasion. It's not as though we haven't been trying. But it's a little frustrating when they won't tell us what they want, and they don't respond when we tell them what we want. Now, as it happens, today was my grandson's birthday and I honestly would prefer to have spent the day with him. But I was here, as were we all, in an attempt to find common ground with the Nolroy. Now, if you feel that there's an avenue that we haven't tried, perhaps you would choose this moment to share it with us."

Vincent Donaldson scratched an itch that had suddenly developed on his nose, the better to cover a smile. Leave it to Michael to save them from another thinly-veiled partisan plea for results in time to re-elect the incumbent.

Feston glared at Yaspers. "Michael, I wouldn't put it past you to be negotiating something on the side, just so you could hand it to the Democrats."

Yaspers nodded imperturbably. "I know. You've accused me of this on at least a dozen occasions. However, I note that you have made no progress. At least none that you have chosen to share with the rest of us."

"Michael, I'll remind you that—"

At the other end of the room, the door suddenly swung open. A tall man with chiseled features stood framed in the doorway as he surveyed the tense faces that turned towards him. There was a long pause.

Brian Feston was the first to speak. "Randall?"

The man in the door smiled slowly. "Yes, Brian, it's me."

"I thought you were in Cairo."

"I was. Now I'm here."

"The peace accord—"

"Done," Randall Jennings said airily, as he walked the length of the room. He stopped at the other end of the long conference table. There were no extra seats left. The Nolroy didn't need them, and there had been only one per human.

"Then—"

"I'd intended to stay on in Cairo for another week or so—delightful city, by the way—but the president requested that I come back to assist in the negotiations with the Nolroy. I'd have been here sooner, but the Nolroy didn't arrive until after I'd begun talks with Rashad Ibrahim Rifaat, and I couldn't walk away. There wasn't anyone else he trusted to accomplish his goals. But now that that's done, I can chip in here. Perhaps we can bring this to a successful conclusion." He smiled winningly. "Don't worry, you're still in charge. I'll just try to help out a bit."

Feston understood full well the implications. The president was dissatisfied with the progress being made and he hoped that Jennings, a man many compared to Henry Kissinger in the realm of statecraft, would be able to succeed where he had failed.

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The addition of Randall Jennings to the team had contradictory effects on the human delegation. On one hand, they were filled with new confidence; after all, the man had single-handedly managed impossible diplomatic breakthroughs. His abilities were legendary. On the other hand, they felt jealous and threatened. What had been a more or less evenly matched group was now overshadowed by the presence of the acknowledged superstar of their era. When the history books were written it would be Randall Jennings who received credit, no matter who achieved the actual breakthrough.

Only . . . things didn't really move all that much faster.

"*Tonika lan boon. Tonika lan boon.*" Jennings had subtly moved to the forefront of the negotiations. It was he, not Brian Feston, who now delivered the ritual parting wishes for a safe and happy journey as the Nolroy left the room.

The late night progress meetings were somewhat less acrimonious than they had been—a testament to Jennings's calming influence, no doubt—but nonetheless there was still little to report. The night was far advanced when they wrapped things up and left for their various homes.

A member of the custodial staff was mopping the floor in the corridor as they filed out of the meeting room. Vince Donaldson was trying to be helpful, but perhaps some of his pent-up frustration leaked into his voice when he said, "Hey, janitor, you missed a spot."

The janitor bit his lip and said nothing.

"*Tonika funally irdo.*"

And so the welcoming greeting went, wishing the Nolroy a pleasant stay.

"*Tonika funally irdo.*"

The Nolroy, all eleven of them, filed into the room. To human eyes, their stiff-legged gait was clumsy and ungraceful. There was no knee to speak of, and only a rudimentary ankle. All motion of the front two legs was based on a slowly pivoting shoulder joint. The rear legs were much shorter and even more restricted in their motion, essentially moving in unison to provide the rear leg of a tripod, leaving the long, cylindrical body tilted at a forty-five degree angle. Stairs in particular appeared to give the Nolroy a great deal of trouble. Yet they insisted on coming to this second floor room. First floor rooms had been offered. The elevators had been pointed out. Still the Nolroy climbed the sweeping marble stairs. No one knew why.

Randall Jennings greeted each Nolroy as though he'd known them all his life and held them in the highest personal regard. He briefly pressed his carefully manicured fingers to their bark-like scales in the prescribed manner and gave the ritual greeting as he'd been taught by the other members of the team. The Nolroy each politely said, "*Punaka wan,*" in thanks for the hospitality they were about to receive. Then they listened to speeches from Randall Jennings and the others describing the great and glorious future that awaited their two respective races as they stood shoulder to shoulder facing the challenges . . . and so on and so forth for hours from late afternoon until mid-evening, at which point they broke for refreshments. Or at least the humans did. No one knew what the Nolroy ate, although they had been known to gulp a little water once in a while.

After refreshments, the humans resumed their attempts to communicate with the Nolroy in one-on-one sessions. In their hearts, they despaired, having come to feel that it was a fruitless endeavor, but it needed to be done, all the same.

The janitor heard the door close behind him. Under his breath he was grumbling about the stupid politicians and their late night meetings. Why

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couldn't they handle this stuff during the day and leave him in peace? And the nerve of that young snot last night, telling him he'd missed a spot—

At which point one of the Nolroy tracked straight through a gleaming, wet stretch of clean floor. His temper snapped.

"*Hey!* Don't walk there! I just mopped that."

The nearest Nolroy, a short specimen of only seven feet or so, stalked slowly over to the janitor. "I'm sorry. What did you say?"

The janitor flung his hand at the smeared floor, the very picture of aggrieved indignation. "I've been out here mopping since midnight. You guys just tracked right through my clean floor. Now I've got to mop it all over again!"

As the janitor spoke, the Nolroy before him retreated half a step. "But—"

"And what are you folks doing in here this late at night, anyway?" the janitor demanded. "Can't you just do your," he waved his hand in the air vaguely, "talking or whatever during the daytime like everyone else?"

"Our bodies keep to the same schedule as on our home world. This is the time when we would normally be awake if we were home."

The janitor pushed back his cap and scratched his head. He'd asked the same question of his supervisor and gotten a long-winded sermon that amounted to 'ours is not to reason why.' Finally . . . an explanation he could understand. "Huh. Kinda like me, I guess. Even days when I'm off, I get up and go to bed at the same time. Just makes sense." Then he remembered to be mad. "Still, you should watch where you're going. If you see a wet place, try to go around it. Besides," he said, craning his neck to look up at the Nolroy towering over him, "you could slip and hurt yourself."

"Slip?"

The janitor frowned. "What's wrong? You don't know that word?"

"I don't know slip."

"Fall."

The Nolroy's eyes widened. "Fall? Slip means fall?"

The janitor nodded. "'Zackly! A wet floor is a slippery floor. See that yellow sign over there? I put that up to tell people to be careful."

The Nolroy turned ponderously, spending a long moment studying the depiction of a red stick figure in midtumble. "The yellow sign? That is yours?"

"Yeah. Why?"

But the Nolroy turned to another and said something that sounded like he intended to crash his couch and eat a rubbery Tuesday. The exchange was lost on the janitor, which infuriated him. He drew himself up to his full height, just over five feet, five inches, and said, "Hey, look, I know I'm just the janitor, but don't go talking about me like I wasn't even here. If you've got something to say to me, say it out loud. In English."

The Nolroy's oral orifice puckered as though it had tasted something sour. "What is your name?"

In one splintering second, the janitor suddenly realized the full gravity of what he'd done. You don't speak rudely to the diplomatic envoys of an alien race. It just isn't done. Make 'em mad and they might just use a ray gun to turn him into a rubbery Tuesday. Still, there was nothing for it but to stand up and be counted. "Elsworth Smith. What's your name?"

"Teldan."

"Listen, Teldan, you wanna be more careful about wet floors. I'd hate for you to get hurt if you slipped."

"We will not get hurt. Goodnight, Elsworth Smith."

And with that the Nolroy began their nightly controlled fall down the stairs, leaving Elsworth Smith to consider the very real possibility that come morning he might be without a job.

Worse yet, the Nolroy might crash his couch.

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But the phone didn't ring all the next day and no one said a thing to Elsworth Smith when he arrived for work that night. Still, he thought maybe it would be wise to avoid the Nolroy, so he began mopping on the opposite end of the building. That, he felt, would give him a little buffer space between those weird looking aliens and his wet floor.

He stepped into the south wing bathroom sometime around three, thinking that the coast must be clear by now. After all, the aliens had gone home about two the night before.

It was as he was drying his hands that he heard dry twitterings near the door of the bathroom. Stinging ice filled his veins . . . they'd tracked him down and were waiting in ambush! He glanced around the room and saw nothing he could use as a weapon. Well, then that was just the way things were going to have to be. Just him and his fists.

He jerked the door open, fully prepared to turn into a puff of smoke when the space aliens' ray guns got him, only to find himself completely ignored, clenched fists and all . . . as eleven towering aliens took turns galloping pell-mell at a wet streak down the middle of the hallway, jumping, and sliding . . . *sliding*, mind you, all the way to the end of the hall. Who knew they could move so quickly?

Fists forgotten, Elsworth Smith stood there with his mouth open, watching the bizarre spectacle.

A dull *boom* reverberated down the corridor as one of the aliens lost his balance and fell. Squealing and flailing, he slid writhing to the end of the hall, slamming into the wall. Had it been a drawing in a comic strip, there would have been little stars of pain shooting out of the poor creature, but this was a real Nolroy in real pain. Another alien went galumphing down to check on him, but Elsworth made it there first. "Hey, man, are you all right? That musta hurt!"

The Nolroy looked at him with slitted eyes, then grabbed him and threw him against the side wall. The breath exploded from Elsworth's lungs as he slammed into the unyielding plaster. He slid to the floor, gasping. The alien leaped, landing at Elsworth's feet . . . reached for him . . .

"Are you hurt, Elsworth Smith?" the alien rasped, just as another Nolroy hurtled into the space where they had been. It then turned to the alien who had just completed a slide. "Sobow! You might have hurt Elsworth Smith!"

Elsworth blinked, still trying painfully to fill his lungs with air. Slowly it dawned on him—the Nolroy had saved him from being squished by several hundred pounds of hurtling alien. Elsworth's back had been turned, but the alien must have seen his fellow creature sliding towards them and had hurled him out of harm's way.

And Elsworth had thought he was under attack. "Huh," Elsworth said, scratching his head. "That was kindly of you."

The alien turned back to Elsworth. "You are not hurt?"

"Well . . ." He thought about mentioning that it hurt like hell to have the wind knocked out of him, but decided that the greater good was what counted. "No, man, I'm fine. Thanks. Wouldn't have wanted that big fella landing on top of me."

"Indeed. Sobow is much larger than you are and it could have hurt had he slipped on you."

"Fell, er, fallen," Elsworth corrected absently. "Um, aren't you afraid of hurtin' yourselves sliding around like that?"

"This is fun. We haven't enjoyed humans like this yet."

Something was wrong with the sentence, but Elsworth decided that as long as he wasn't in danger of being eaten it would be best to gloss over the problem. "You mean you haven't enjoyed being around humans?"

"Not like this. You suggested this last night. We have been waiting hard all day to try this slipping. We wondered what

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slick floors were for. Now we understand. Great fun!"

An almost inaudible susurration accompanied the transit of another alien down the hall. It reached the end and commented casually to the one standing with Elsworth that the hardened green steak had grindled. The two of them started off towards the other end of the raceway. Elsworth watched in amazement as one grabbed the mop out of his bucket and used it to slop a prodigious amount of water onto the floor. They then carefully spread the water down the length of the hall and began lining up to take their turns at sliding again.

Elsworth Smith was no stranger to disconnected reality. Indeed, he'd ingested one or two substances in his youth that had left him wondering whether reality was all it was cracked up to be. However, seeing eleven aliens sliding merrily down a water-slickened government corridor in the wee hours of the morning was enough to shake his reason.

So he did the only sensible thing.

He took off his shoes and joined them.

"*Tonika lan boon*," Randall Jennings said solemnly. "*Tonika lan boon*."

He watched the last alien head for the stairs, then turned back into the room, closing the door. His brow was furrowed, but he had the beginnings of a smile.

"So we know something they want now," he said wonderingly. "They want to . . . to . . . *fall?*" He shook his head.

Elizabeth Banks looked as troubled as Jennings. "It must be a problem with the translation."

Vince Donaldson nodded. "Gotta be."

Michael Yaspers pursed his lips thoughtfully, then shook his head. "I'm not so sure it's a translation problem. It might be some sort of a cultural disconnect. For instance, what if falling has some sort of religious significance for them?"

Brian Feston snapped his fingers. "I think you've got something, Michael. What do we know about their religion?"

"Nothing."

"Nothing?"

"Nothing," Yaspers repeated. "They won't talk about it."

"Wow!" Brian breathed. "We may have just gotten a glimpse behind the curtain, people. A glimpse at their fundamental beliefs. If we handle this properly, we might be able to make some *real* progress."

Randall Jennings spoke for all of them when he said reverently, "Ladies and gentlemen, we have just witnessed the dawning of a new era."

Turning quiet, deserted hallways into water slides palled after a week or so. But by then Elsworth Smith was well on his way towards seeing the Nolroy as friends instead of crusty logs walking on stiff arms. He was even learning to tell some of them apart based on the patterns in their rough-scaled exoskeletons.

Late one night, Elsworth took them up through the access door to the roof. Washington was mainly dark by that hour. Only streetlights and a few widely scattered windows were lit. Traffic was largely silent. It was a quiet, peaceful time of night.

"I learned a few stars and constellations when I was a kid. Planets, too." He turned to the east, pointing. "That one's Venus."

Blanso took a deep, slow breath. So deep that Elsworth was afraid that he would expand like a balloon and float away on the breeze. "Venus. The planet."

"Yep," Elsworth said, sitting on the edge of the roof with his arms circled around his knees, heedless of the four story drop beneath his feet. He was not afraid of the towering black silhouettes that surrounded him in the night. "Venus comes up before dawn these days. Means it'll be getting light soon. Then, other times, it shows up at sunset. Just depends."

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Kindi looked down at the small man huddled at the edge of the roof. "It is beautiful. We like the night sky you have here. There are fewer stars than in our sky. It is odd looking, but allows more room to appreciate each star as an individual."

"And Venus," Blanso added.

"And Venus," Kindi agreed.

And three of the Nolroy towards the back of the group began to sing, an eerie harmony of blended vowels that was both serene and mysterious.

In that moment, Elsworth Smith, born of Hank and Nancy Smith of Flat Rock, North Carolina, felt more akin to the alien Nolroy race than to his own.

It filled him with more happiness than anything he had ever known.

"They want to be able to see the *night* sky?" Vincent Donaldson demanded.

"I thought they were daytime creatures," said Elizabeth Banks.

"Diurnal," Michael Yaspers put in. "That's what we were told."

"Apparently, they're not," observed Brian Feston.

"No wonder we weren't making any progress. The advance reports from the scientists were wrong," Randall Jennings noted.

"Damned scientists," Donaldson said. "So wrapped up in their theories and hypotheses that they can't see the truth when it's sitting right in front of them."

"So it's up to us, I guess, to straighten this whole mess out," added Elizabeth.

"I never trust scientists. They never tell me what I want to hear," said Feston.

Jennings sighed. "Then there's nothing for it. We'll just have to toss out everything the scientists told us and wing it."

Elsworth Smith actually looked forward to going to work for the first time in years. His Nolroy buddies always made time to come see him after they were done with their official yak-yak sessions with the honchos. He worked hard. He worked fast. He especially made certain the bathrooms were swabbed down before the Nolroy showed up. He had a sneaking suspicion that they might like to play in the bathrooms. That would be dangerous and possibly . . . gross. It was better not to tempt fate. They still slid down the hallways sometimes, but mainly they just went up on the roof and talked while watching the night sky pivot slowly above them. Though rain didn't bother the Nolroy, it wasn't as much fun if there weren't any stars to look at, so they'd gotten in the habit of using a meeting room at the far end of the south wing of the third floor during inclement weather.

The weather had turned muggy with an intermittent drizzle, so Elsworth had taken the liberty of getting the conference room ready. In fact, he'd arranged a small surprise. He'd ordered in pizza and some soft drinks. He wasn't sure whether they liked pepperoni but, hey, nearly everybody likes pepperoni, so he figured the odds were in his favor. He did know that the Nolroy didn't sit, so he'd pushed the chairs over to one side so they'd have more room to walk around. He stood, hands on hips, nodding with satisfaction. Everything was in readiness.

But the moment that Teldan pushed through the door, Elsworth knew that something had gone wrong. The Nolroy faces were not easily read by humans, but something about the position of Teldan's arms just seemed to signal dejection. "What's wrong?" Elsworth asked, concerned.

Blanso came in behind Teldan. "It's all falling. The humans don't listen, even to each other."

"Even to themselves," Kindi added.

That didn't sound good. Unwilling to let his surprise party go flat without a struggle, Elsworth said, "I'm sorry to hear that, man. Here, look, I got you guys some pizza and drinks. Maybe that'll cheer you up."

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Sobow, who had been a bit reticent around Elsworth since the sliding incident in the hallway, went so far as to say, "You are a true friend. You knew exactly the night we would need assistance for our moods."

"I'm sorry there's not more, but it's, uh . . . it's all I could afford. But I went back over the pizza with a sharp knife and cut it into enough decent-sized slices so that all you guys could have one each."

"Will you be eating?"

"Oh, I'm not hungry." In fact, he was ravenous, but he was determined that the Nolroy would get one ceremonial slice each as a token of how he felt about them. They were great guys. Better friends than some humans he could name. Come to think of it, they were better than nearly all the humans he could name.

The Nolroy then lined up and filed past the pizza boxes, each taking his allotted slice and a drink can. When it turned out the Nolroy's manipulating palps had trouble with the pull tabs, Elsworth went down the row, popping the tops.

By the time he reached the last Nolroy, he heard a tremendous, blasting belch behind him, followed seconds later by another, then another, and another, as the Nolroy quickly chugged the entire contents of the opened cans, then burped resoundingly. The pizza slices took a little longer, punctuated as they were by even more burps. The Nolroy looked from one to another, then at Elsworth.

"We were under the impression that it was considered rude to eructate in the company of humans. Why do you feed us liquids that cause explosions? Are you not offended?"

Actually, Elsworth was trying very hard not to burst out laughing, but that wasn't something he wanted to admit. "Uh, no, it doesn't bother me. I burp all the time at home."

"But . . ." Kindi began, then started over. "Why do humans drink things that will make them burp, if burping is rude? Are humans rude on purpose? Your manners are so odd." He paused. "Especially politicians," he added.

"Man, to answer that one, I'd have to be a whole lot smarter than I am now. Beer's carbonated, too. Come to think of it, carbonated drinks are mostly the sort of thing you drink with your friends—the kind of people who don't care if you burp out loud."

"Then we accept your gesture of friendship," Blanso said. Then he turned to Teldan and lapsed into a prolonged set of noises that sounded for all the world like a committee of crows speaking in tongues.

Elsworth waited patiently, having learned by now that they would bring him up to speed once they'd conferred among themselves. Blanso had just turned back and was opening his oral orifice to speak when the doors burst open and Randall Jennings swept imperiously into the room, followed by a group of armed FBI agents.

Jennings drew himself up to his full height and said, "And just what do you think you're doing?" He leaned down to glare directly into Elsworth's eyes. "I'll bet *you're* the reason we're having so much trouble getting anywhere with the Nolroy," he hissed.

An FBI agent nearly twice Elsworth's size grabbed his arm and spun him around. Bracing a forearm across Elsworth's back, he slammed his face into one of the empty pizza boxes. Pain blinded Elsworth and before he could reorient himself, his hands were secured behind his back. He was jerked upright and marched rapidly towards the door, nose bleeding profusely. He glanced over his shoulder in fear, seeing Elizabeth Banks trying to placate an obviously distraught Sobow. Then the guards turned into the corridor and that was the last he saw of the Nolroy.

Brian Feston stood at the window of

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the conference room watching the flashing blue lights drive into the night. He turned as Randall Jennings returned from assisting in the capture of the janitor.

Jennings stood for a moment with his head bowed, his hand on the edge of the door. Then, without warning, he whirled, in one motion slamming the door and letting out a bellow of animal rage. "How in *hell* did this happen?" he demanded. "How did that insignificant pipsqueak of a *janitor* gain access to the Nolroy? Where was their damned security detail?"

An evil voice had awoken in the back of Brian Feston's mind. It was whispering that if he played his cards right, Randall Jennings would be discredited and he could resume leadership of the negotiating team just as they were beginning to make progress. All might yet be made right. "Smith took advantage of the one gap in security. Once the Nolroy were in the building, they were presumed to be safe. No one could enter or leave without our being aware of it. The assumption was that we were the only ones the Nolroy would talk to. The custodial staff was, so to speak, below the radar. Invisible. Then when the Nolroy left, their security detail was to take over and see to it that they were safely transported back to their compound. Since they were still in the building, their guards thought they were still talking to us."

"Still talking to us? About what? We've been done for nearly an hour!" Jennings thundered.

"They didn't know that. And we leave through the north entrance," Feston pointed out. "Part of the problem was that there was insufficient coordination between the various security teams. The Nolroy security contingent never knew when we left. They only knew that they were to take over the Nolroy when they came out the main doors, and no one ever thought to tell them about our movements so that they would know when to expect the Nolroy."

"That's childish. Simple minded. Stupid. Idiotic!" Jennings spat.

"That's what happened," Feston said calmly. He knew that Jennings, being a seasoned politician, would quickly realize that his position was politically vulnerable. The thought of Jennings on the defensive was delicious, indeed.

"And just how is it that you've already managed to figure out what happened?" Jennings asked suspiciously.

"While you were with the FBI apprehending Smith, I went to the heads of the security teams and started putting the pieces of the puzzle together."

Jennings's eyes narrowed. "And did they have any *other* wisdom to impart?" he inquired sarcastically. "Like, perhaps, just how long this has been going on?"

That was a question Feston didn't want to answer, because it could very well have begun during the time he was in charge and that would destroy any leverage he might be able to get out of the incident. "Smith's not talking. Says he's innocent."

"This so-called janitor is named *Smith?* Nobody is named Smith. It's too common. Too pat. Too ordinary. It's got to be an assumed name," Jennings said.

"I've already talked to the FBI about it. They have assured me that they will put," Feston paused to cough delicately, "high priority on Smith's interrogation."

Something in his gut told Elsworth that it was probably late at night, but they'd taken his watch and there were no windows, so it could have been dawn or dusk for all he knew. The government men worked in rotating teams of three, hammering him with questions, and they'd been at it for hours. What time it was was the least pressing question on his mind at the moment. Others were more important, such as whether he'd live through this ordeal or just quietly disappear.

"*Hey!*" A hand shook his shoulder roughly. "I'm talking to you!"

"Yeah, I know," Elsworth mumbled.

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He was incredibly tired. For the first few hours, he'd been running on pure adrenaline, but now he just wanted a little while away from the men who kept screaming at him.

"Who are you working for?"

"The government. I'm the janitor."

"I mean who are you *really* working for? The Chinese? The Russians?"

"What are you talking about?" No matter how Elsworth tried, he couldn't make sense of it. They kept asking the same questions over and over. Elsworth kept giving the same answers over and over. But they just kept getting more and more angry. They wanted different answers and clearly weren't going to give up until they heard whatever it was that they wanted to hear. That's the problem with people who make up their minds before they have the facts, instead of after.

The man shook his head slowly. "Don't try to act innocent with me . . . it won't wash." He reached out and flicked dismissively at Elsworth's short, graying ponytail. "Somebody like you's probably been a Communist for a long time, right?"

Elsworth tried desperately to think of a way to assure the man that he was as American as anyone, but it seemed likely that anything he said was going to be twisted. Still, he gave it his best shot. "Look, I don't know what you want, but—"

"The *truth*, dammit! I want the truth!"

"I already told you the truth. I'm the jan—"

"The *real* truth, Elsworth. Not your cover story. We've already checked out your cover. It's too good to be true. The only way anyone could be that clean is if they just fell out of the sky. You know what that tells me? That tells me that you're a plant. Your whole identity is a lie. Only they made it a little too good. Nobody's that lily white. So clearly it's a made-up life . . . a cover story. And I mean to have the truth out of you if I have to—"

It was the longest night of Elsworth's life.

"*Tonika funally irdo.*" Randall Jennings nodded gravely to Tranis, then repeated his greeting to Sobow, who, oddly, was just as silent as Tranis had been. In fact, all the Nolroy were silent.

Not a single reply did he get to the formal greeting.

The Nolroy stood silently in a line at the end of the room. There was a long pause before Teldan spoke. "We are concerned about this matter of Elsworth Smith."

Jennings stood, head held high. "I understand your concern. I'd like to begin by apologizing—"

"Why is it needed that you apologize for true contact?" Teldan asked.

Jennings allowed himself a small, satisfied smile. "Well, yes, I know that it took a bit for us to understand one another. See, our scientists had told us so many things that turned out to be wrong. For instance, now that we know that you are nocturnal, we—"

"Nocturnal?" Blanso asked.

"Scientists mistaken?" Kindi asked, turning to look at Blanso.

"It's terribly embarrassing," Jennings admitted. "But they told us so many things that turned out to be wrong. It took a while for us to unravel their mistakes. Now we're on the path to true understanding between our two races. We'll continue build a strong working relationship that will lead us into the future together. We are honored that the Nolroy sent such honored and wise individuals to—"

"Excuse us, please," Sobow said. "We'd like to know where our friend Elsworth Smith is."

"*Friend?*" Jennings blurted, before catching himself. "He's not really your friend. He's only a janitor. He's not worthy to speak to persons of your status."

The Nolroy stood as still as statues for a long moment. It was Teldan who final-

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ly broke the protracted silence. "Randall Jennings, it would seem that you have not understood us."

Jennings held up his hand. "I know, I know. The fault is ours."

"Yes," Teldan said, "it is."

And with that, he turned and walked out of the room, the other Nolroy following silently behind.

JANITOR TO NEGOTIATE WITH NOLROY

IN AN UNEXPECTED DEVELOPMENT, ELSWORTH SMITH, A CUSTODIAN FOR THE UNITED STATES GOVERNMENT, HAS BEEN SELECTED BY THE NOLROY TO BE THEIR CONTACT WITH EARTH. AFTER FOUR MONTHS OF NEGOTIATIONS WITH LEADING DIPLOMATS, THE NOLROY HAVE COME FORTH TO SAY THAT THEY DO NOT FEEL THAT FURTHER TALKS WILL BE FRUITFUL. RANDALL JENNINGS, THE CURRENT CHAIRMAN, AND BRIAN FESTON, HIS PREDECESSOR, WERE SINGLED OUT AS HAVING IMPEDED UNDERSTANDING BETWEEN THE NOLROY AND HUMANS. JENNINGS, LEAVING THE WHITE HOUSE EARLY THIS MORNING AFTER A MEETING WITH THE PRESIDENT, HAD NO COMMENT. FESTON, WHO UNTIL RECENTLY HAD BEEN THE HEAD OF THE HUMAN NEGOTIATING TEAM, SAID ONLY THAT HE WANTED WHAT WAS BEST FOR THE FUTURE OF OUR TWO RACES.

IT WAS A STUNNING TURN OF EVENTS IN THE HISTORIC MEETING OF HUMANS AND THE FIRST EXTRATERRESTRIAL RACE TO . . .

It was, hands down, the scoop of the year—probably of the decade. *The Washington Post* made the most of it, running it on the front page, with supporting articles scattered throughout the rest of the paper, covering everything from the history of human contact with the Nolroy to profiles of the major players, including a brief summary of Elsworth Smith's life. But it was the front page story that rocked Washington to its core.

The Nolroy had called the *Post* and politely requested that a reporter be sent over as soon as conveniently possible. Such a thing was unheard of. The Nolroy had been reticent to a fault, never granting interviews. The *Post's* reporter, Linda Hanst, arrived in twenty minutes, having run every red light and broken every speed limit. To her credit, she had only caused two accidents as cars swerved frantically to get out of her way.

She got the scoop, she wrote the story, and it made the front page. The aftermath was as shattering as it was predictable . . . at least in hindsight.

Careers ended that day. Randall Jennings and Brian Feston were called in to meet with the president. Both left looking shame-faced. The other members of the human contact team fared little better. All fell into obscurity with astonishing rapidity.

The Nolroy made one request and only one. For all the fact that it was so politely made, it had the force of an ultimatum: That Elsworth Smith be found and returned to them immediately so that they might resume negotiations with the human race.

Elsworth Smith was "found" in record time. True, he was somewhat the worse for wear, but after spending the night in an undisclosed location receiving medical attention for dehydration, exhaustion, and multiple contusions of unexplained origin, he felt sufficiently recovered to go back to his apartment. He had intended to invite his Nolroy friends over for pizza and the fizziest drinks he could find—overdrawn checkbook be damned—but on discovering that his apartment had been ransacked in an attempt to discover evidence of his putative allegiance to foreign powers, he realized that his plan was not going to work.

Sobow, who was with him as a self-appointed bodyguard and antidote against a sudden proliferation of Federal agents, in turn extended an invitation to dine on fizzy drinks and pizza at the Nolroy compound, which Elsworth gratefully accepted. Rather than send him home to his wrecked apartment at the end of the evening, they gathered together as many soft things as they could and made a

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small nest for him to sleep in.

Elsworth Smith slept peacefully that night, snoring softly as the Nolroy took turns watching over him.

Sobow stood stock-still, facing an intimidating array of microphones. He spoke without notes or even a podium. The other Nolroy were gathered in a protective semi-circle around Elsworth Smith to the right of the stage.

"Ambassador, uh, Sobow, I'd like to clarify what you've just said. You said that Elsworth Smith is your choice to be the human ambassador. That's highly irregular. Normally . . . well, at least for humans . . . each of the negotiating parties selects their own representatives."

"You are?" Sobow prompted.

"Oh . . . sorry . . . Frank Paris, *New York Times*."

"Mister Frank, we have had our time wasted here on Earth by people who posed as politicians. They were rude to us, selfish, and showed no signs of wanting true contact. Were it not for the fact that we were conducting parallel negotiations with Elsworth Smith, no progress would have been made at all. It was only through him that we were able to begin to understand humans and find common ground. We will negotiate with Elsworth Smith and no one else. He is a fine human. It is shameful that the upper class treats him—and the Nolroy—so badly."

Paris blinked. "The upper class?"

"Randall Jennings, Brian Feston, and the others of the human contact team are of higher class, and they never for a moment let us forget it. In the most horrible ways, they continually reminded us of our low status."

A hand shot up. Sobow twitched a forelimb in that direction. "You may speak."

The woman raised her voice in order to be heard clearly. "I'm Bethany Webster of CNN. Ambassador Sobow, I understand that Elsworth is a custodian, but surely you don't think of yourselves as a lower class. What could be more important than establishing contact between two races of beings?"

There was a long pause before Sobow spoke. "What could be more disgusting than politics? There are few occupations more demeaning to the individual. Clearly, it is necessary to the functioning of society, but so is garbage collection. Is a garbage collector given high status? No. It is a necessary, unpleasant, dirty job that must be done and done well, but for politicians to be revered is surely the sign of a sick society. We nearly gave up hope of being able to talk to humans at all. That was before Elsworth Smith, of course."

A hand went up, followed immediately by a voice that did not wait to be recognized. "Marshall Rudd, ABC. But why Elsworth Smith? He's just a janitor."

"Precisely. Someone more nearly on our status level. Randall Jennings and Brian Feston were frequently pressing our limbs into our low-status positions—pointing out that we are ambassadors, merely another word for politicians. This is highly insulting. It's bad enough to be a politician, but to be reminded of it constantly is bad manners. Elsworth Smith, being more sensitive, never once pressed this on us." Another pause, this one so long that two more hands shot up, thinking that he had finished. But then Sobow added, "But Elsworth, in his kindness, taught us how to slip gracefully. He showed us Venus, and he bought us fizzy drinks. A true friend. I am proud to have finally met a humble human."

At this, Sobow, the most eloquent of the Nolroy, found that his command of the English language failed him. Without further comment, he turned and left the stage. The other Nolroy followed, taking Elsworth Smith with them.

Let the record show that Elsworth Smith fulfilled the duties of his office as human ambassador with distinction. ■

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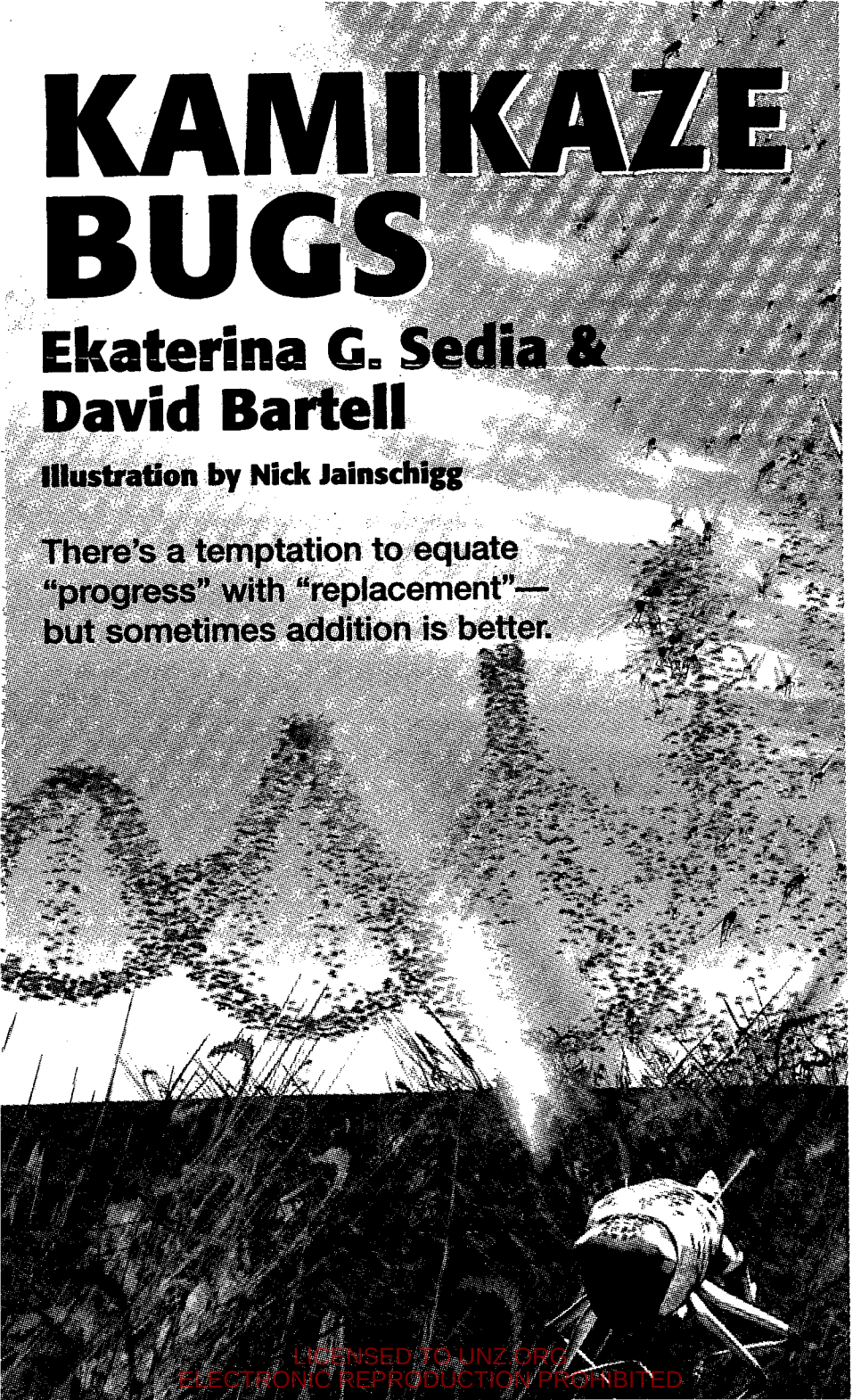
KAMIKAZE BUGS

Ekaterina G. Sedia & David Bartell

Illustration by Nick Jainschigg

There's a temptation to equate "progress" with "replacement"—but sometimes addition is better.



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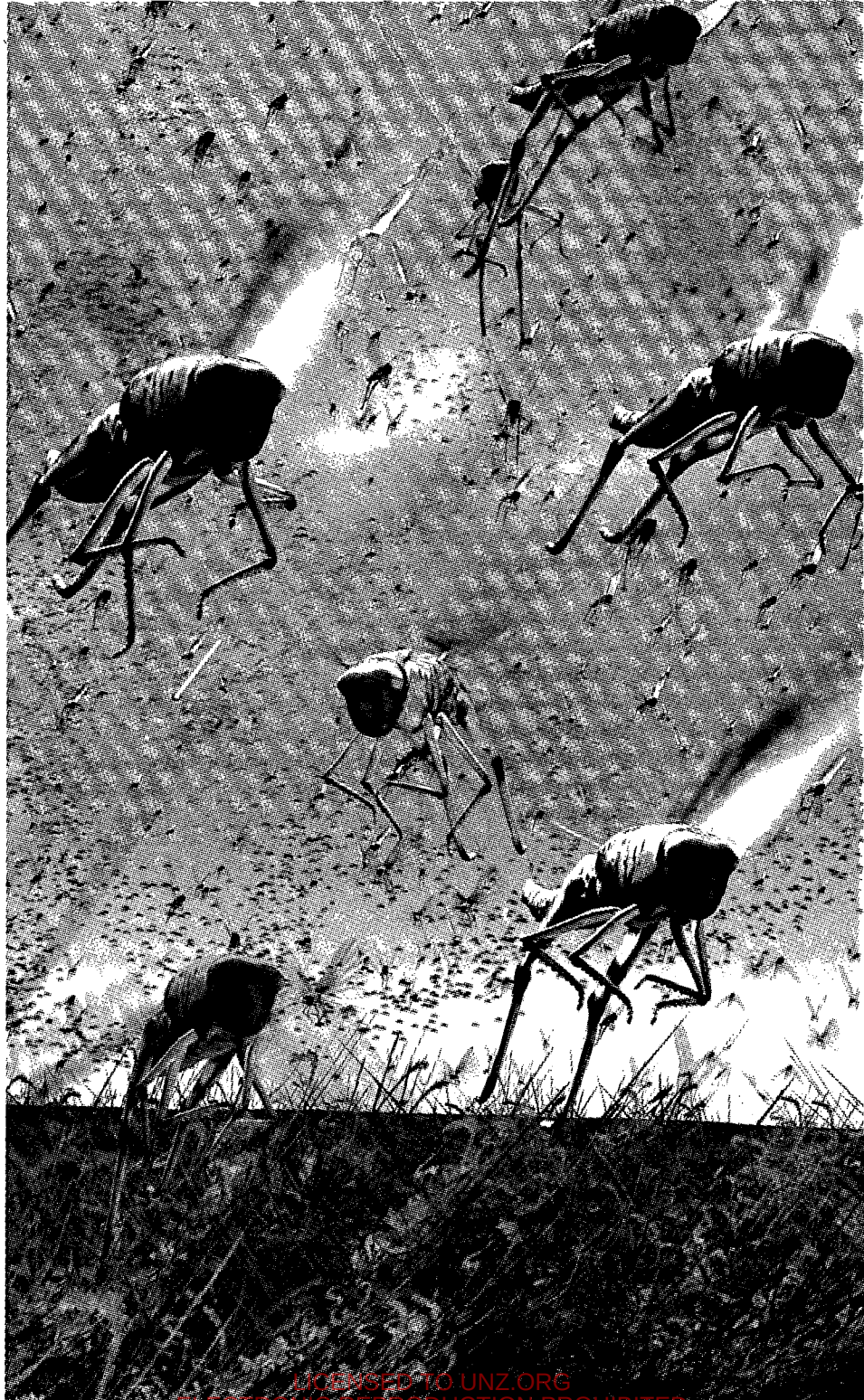

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If I were a jealous wife, the Men in Black would have remained in the movies, cigarettes wouldn't be a priceless commodity, and African jit jive would not be playing on every FM station in Kentucky. However, I'm not jealous, and when the phone rings and a pleasant female voice asks for Gus, I simply say, "He's not home. May I take a message?"

"Yes," the unknown woman purrs. "This is Diane Thrench, an old friend of his. Have him call me. It's important."

"Okay," I say, and write down the number.

"When are you expecting him back?"

"Hard to say. Depends on who wins the World Cup—he's watching it with the rest of the clan at his dad's," I say.

The woman laughs. "Oh my god," she says. "The Lanleys. What a memory."

Humph. An "old friend" who'd met his family. "Yeah. I'll tell him you called then."

"Thanks," says Diane Thrench. "Just out of curiosity—are you his girlfriend?"

"No, just his wife," I say. Still politely.

"Oh . . . congratulations."

We say goodbye, and I hang up the phone. Not insecure, but annoyed. I fight the urge to call Jack, my daddy-in-law, and demand an explanation. But that would be counterproductive—interrupting the World Cup has broken a few Lanley marriages. It's just not done.

I grab two cats who happen to be in the room—black Cheshire and tabby Lucretia—and settle in to watch cartoons. I hear the key in the lock, and Gus walks in, hunched over and depressed.

"Who won?" I say.

Gus winces. "Brazil. Impossibly." The cats dump me to crawl all over him.

"I'm sorry," I say. "Who's Diane Thrench?"

"We went to grad school together and dated for a while. Why?"

"She just called," I say. "It's something important. Asked you to call her back."

"Not now," Gus says.

I give him the phone. "Aren't you curious? What if she called to inform you that you have a son by her?"

"I doubt it," Gus says, but dials. I get up to give him privacy, but he grabs my arm and sits me back. "Diane? It's Gus. Jessie told me you called. Yeah, my wife. Thanks. Great, great. How are you? Oh, good." He makes a face. "No, I don't think I owe you anything. An apology for kicking you out of the Thanksgiving dinner ten years ago?"

I prick up my ears.

Gus rolls his eyes. "Really? Well, that's great. Yes, I know, organizing a conference is a pain in the ass. Yeah, Oregon is nice. Who else is on the committee? Really? *The* Daniel Ulm? Wow. And what does it have to do with me?" He listens to Diane's babbling. "Haven't you heard that I quit? I run a pet shop. Yeah, ha ha. No more academia, no more conferences. I'm surprised you're inviting me—shouldn't I be firmly forgotten by now?" Gus laughs. "Oh, is that what they call it? A classic? Tell you what: I'm unaffiliated, so unless you're covering all the expenses, it's a no. For two. No, I cannot be away from my wife for four whole days. No, it's not negotiable. In that case—a tentative yes. Let me talk to Jessie and I'll call you back. Bye."

I stare with my arms crossed. "Conference on gene regulation in Oregon?" I guess.

Gus nods. "Four days. The organizers cover all the fees, hotel, airfare, and two hundred bucks a day expenses. All they ask in return is half an hour talk."

"I don't know," I say. "Will you be stuck in the conference all day?"

"No; I'll give my talk—first one of the first day, mind—and then we can spend the rest of the time eating sushi and sampling local microbrews."

"All right," I say. "But before you call Diane, tell me: what was that about Thanksgiving?"

Gus laughs. "That's when we broke up. Dad was still in Rochester then, and I brought her along for a visit. And there were quite a few Lanleys—you know

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that scene." I do—a pack of lean wolfmen skeletonizing a turkey in a manner that would make piranhas look anorexic, and then abandoning their women for a soccer game in the snow. My first time there I did not fancy a talk about potty training, so I went to play soccer with the guys. They were gentle with me—I only had my face rubbed in the snow twice, and got away with a twisted ankle. I smile at the memory, and Gus continues. "So, Diane looked around, and said to me, 'Gus, it is so wonderful that you were able to rise above your circumstances.' I took her by the elbow, led her outside, and drove her to the bus station. Got back in time to score a goal against Uncle Lance."

I try not to feel smug. "Call Diane," I say, "and tell her that we're coming. Think your dad would mind the shop?"

"Sure," Gus says. He grins. Apparently he enjoys being a scientific celebrity still, despite his scandalous abandonment of a tenure-track position at U. Penn. I realize that I've never heard him give a talk, and am kind of excited about it.

Three months later, we find ourselves in Oregon. I imagined a scientific conference to be a very dull and arcane affair, and am glad to see that I was right. It is dull—the town of Eugene is overrun by poorly dressed people, who all know each other and talk in abbreviations. There's also no small amount of flirting going on—I suppose a conference for a scientist is what a business trip is for a CEO.

The night of our arrival we register and explore the town. It has a typical West Coast ambience, symbolized by the fact that they sell bongs in souvenir shops, but insist on calling them "water pipes." Sushi and breweries are abundant, but we go back to the hotel early—we have to get up at the break of dawn for Gus's talk.

In the morning, we walk towards the conference center, stifling yawns. Neither of us is a morning person. Gus looks good, though—he got a haircut for the occasion, and is one of a very few men I know who looks comfortable in a suit and tie. He looks almost respectable *sans* ponytail. When we enter the conference hall, I realize that it is nice to be married to a celebrity. People recognize Gus and want to shake his hand. I smile, happy for him, until a woman in a suit rushes over to give him a long, lingering hug. She looks like a typical sexy scientist in a sci-fi thriller—long-legged, blond, and blue-eyed. I guess her for Diane. "You look good," she tells Gus. "God, you haven't changed a bit."

"You too." Gus extricates himself from her embrace, gives an awkward smile, and practically thrusts me between himself and Diane. "This is Jessie, my wife."

I smile and shake hands.

Diane gives me a disinterested look. "Oh. Aren't you going to be bored here?"

"Probably," I say. "Are you giving a talk?"

Gus runs interference. "Jessie works in a cancer lab," he says. "She's more up to date than I am."

Diane shrugs at me and smiles at Gus. "Well, let's get you set up. Where're your slides?"

"Haven't got any," Gus says. "I really have nothing new, and everyone here knows my old stuff. I figured I'll do more of a philosophical number."

Diane looks doubtful. "Gus, honestly, you don't have to. Your 1999 paper would've been fine."

"I'm bored with it," Gus says. "I thought I ought to do something more interesting."

Diane gives up, and trots towards the front of the auditorium. The crowd takes the cue and settles. We grab seats close to the exit, and I look at Gus. He seems excited—this is his milieu, no matter how many years ago he quit. I fear that his science-lust will rear its ugly

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head, and I'll have to beat him off a thermocycler with a stick.

Diane is up front, blabbing about the program. Then she introduces Gus, and my one and only walks towards the podium. The lights go off, ready for the projector.

"No need," Gus says crisply, and the lights go back on. Everyone seems slightly confused once they realize that Gus is about to talk without any props.

He smiles. "The topic of this conference is 'Future Direction'," he starts. "I honestly tried to read up on everything I missed . . . I did try to prepare. But in four years of retirement from academia I fell behind, and will never catch up. I've found that I don't really want to."

It is very quiet, and I feel proud of Gus. He seems so comfortable—as if hundreds of people hang onto his every word on a daily basis. He remembers his days as the wonder boy of gene regulation, and plays the part well.

Gus looks over the audience.

"Before the others start talking about future directions," he continues, "I invite you to reappraise the present. Take a look at your booklet of abstracts. I mean no offense to the distinguished attendants, but all of the talks and posters seem to be prepared by the same person: someone with a sequencer fetish." He smiles and waits for the audience to stop laughing. I sneak a look at Diane—she seems pale. Ha!

"It occurred to me that we live in a singular time—for the first time in history, technology is outpacing the theory. We have a very dim understanding of what certain genes do and how they work, but by golly! We've mapped them all. Science used to be about puzzles—questions that demanded answers. Now, we rarely bother asking the question, and sequence and fingerprint and amplify every darn DNA fragment we can get our hands on. Science is becoming a dreary routine—just feed the thing to the machine and see what comes out. Amplify it, and put it into something else."

He goes on for a scant ten minutes, and finishes. "I am not here to criticize, ladies and gentlemen, but to suggest that we ask our questions first. Otherwise, we shall drown in meaningless answers. Thank you."

He strides from the podium. The applause hits as he's sitting down.

I squeeze his hand. "That was a good speech."

"I feel like an ass," he says. "I need a beer."

When the lights go down for the next speaker, we split and find the nearest brewery. Gus is quiet.

"I sympathize," I say, and kiss his cheek. "Offending everyone is not easy."

"You should know," he says, and grins. "I wasn't aiming to offend, though."

"I know," I say, and hear a loud wheezing behind my back.

Gus hears it too—he turns, and his jaw drops. "Dr. Ulm," he says.

An old guy sits down next to us. He doesn't look particularly distinguished, partly owing to the fact that there is a small stainless steel tube sticking out of his throat, but Gus looks at him like a teenage girl at a pop star. Ulm smiles. "Loved your speech, Dr. Lanley." His voice is metallic, due to his artificial voice box.

"Thank you," Gus says. God, I've never seen him so impressed with anyone—except perhaps the Manchester forward. "Are you presenting?"

Ulm shakes his head. "I let myself be dragged into organizing this shindig, and that's it. I hope you don't mind me intruding."

"God, no, not at all," Gus says. He remembers his manners and introduces me.

Ulm looks at me out of his pale eyes discolored by sickness. "Pleasure," he says. "It must be awful, being married to a genius."

"Oh, it's not too bad," I say, noticing Gus turning faint pink from the compli-

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ment. "Nothing a home lobotomy can't fix. All it takes is a paperclip through the roof of the mouth."

"The sad thing is that a lobotomy would not even affect a scientist nowadays," Ulm's canned voice drones. "They would be able to feed the DNA to the machine, and probably would be less bored. You really hit a nail on the head there, Lanley—I think we should be solving puzzles, not operating a conveyer belt. Something more challenging than a pet store for a person with a brain."

Gus shrugs. "Would that it were so."

Ulm smiles, and I feel a shiver up my spine. "Listen," he says. "I don't really blame you for quitting. You're right, of course. What if I told you that I have a puzzle for you?"

"What kind?"

"I've been mulling over this one for quite some time. Perhaps you could give it a stab if you're ever in need of stimulation."

My danger alarm goes off as I notice Gus's face. Still glowing from the praise, he perks up like a warhorse at the sound of a bugle. I kick him under the table, and he gives me a wounded look.

"Sure," he says to Ulm. "I would be honored—if my wife permits, of course."

Now, I am really pissed. As usual, I have to be the bad guy, the harpy from hell who keeps her brilliant husband in intellectual bondage. Just for the record, Gus quit science before we even met. I encourage him to stay away—he usually ends up in trouble if he doesn't. I fume, but say, "It's not like you need my permission, honey."

Gus beams at me. "What's the puzzle?"

"A eukaryotic vector that stays put," Ulm says. "The problem with viruses is that they hop around all over the genome, never staying where you want them, jumping hosts or hiding in dark corners. Here's a puzzle for you—think of a eukaryotic vector that would insert the gene where you want it, so that it will not excise."

Gus spends the rest of what was supposed to be our night out talking to the guy with the fake voice box, and ignoring the woman he claims to love. Scientific conundrums do it to him, especially the kind with dark corners.

When we get back to the hotel, I let him know what I think of Ulm, himself, and conundrums. "Asshole," I say.

"What did I do?" His eyes open wide in pretend ignorance. "There's no harm in thinking about a vector, is there?"

"There's no harm in thinking," I say. "Only before you know it, you'll be reading the scientific journals, and hanging around my lab, and calling your pals at U. Penn, and I won't be seeing you for days. Your lizards will starve to death and the cats will commit suicide because you don't love them anymore."

He looks stricken, and I think I made it through his amazingly thick skull.

"Suicide?" he says.

"They like you better than they like me."

"No, but suicide!" he says happily. "That's it—you know how they have suicide plasmids for prokaryotes?"

I nod. Five years in a cancer lab taught me some stuff. "That's what Ulm needs," Gus says. "A suicide virus that would insert the gene and self-destruct to prevent any future movement. I need to talk to some prokaryote people, and see if we can do it with a phage. Then—a eukaryotic virus. Yes, that should work."

"Did you hear what I just said?" I say.

He looks at me, his eyes glazing over. "Of course, Jessie, whatever you want." Asshole.

When we get back to New Jersey, Gus is swamped with the store and our numerous pets at home, who all want attention. I start feeling lots better—it looks like Gus is able to control his addiction to genetic engineering. He stays away from labs. He does talk on the phone with Ulm and some guys from

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my lab who try to lure him back in, but Gus holds his own, and only deals with theory. Three month later, he figures out how to make a self-destructing virus, and sends his thoughts to Ulm. Ulm thanks him over the phone, and life is back to normal.

Many months later we get word that Ulm has passed away, and—not to be callous—I am relieved that the project is over, and that Gus was able to limit his involvement.

Gus's dad Jack stops by after work, since Manchester is playing Birmingham on pay-per-view. The TV is lit by the two acolytes of Anglosports. I put up feeble resistance. "Soccer again?"

"It's called football, love," Jack says. "What you Yanks call football is a disgrace—where's the glory if you play with a full body armor on? Now, rugby is another matter . . ."

I make a rude noise.

Jack laughs. "Jessie, you should be grateful—if it wasn't for this game, you'd have a husband with a high school diploma."

"Dad . . ." Gus cautions.

"How so?" I ask.

Jack's laughter booms across the house and out of the window. "What, the lunkhead never told you? He went to college on athletic scholarship. No one would've touched him otherwise—not with his grades."

I stare at my genius husband, who is torn between glaring at his dad and grinning at me.

I sigh. "Fine, it's football. Let's watch and get it over with. I'll make sandwiches and get beer."

Jack, divorced from Gus's mom for the past ten years, looks at me with adoration. "Jessie, you're the most normal woman I have ever seen." He turns to Gus. "I can't believe that a nitwit like you did something right."

Gus is still glaring. "Yeah—I don't pick up my dates during the happy hour in Camden bars."

I make a hasty exit to the kitchen—Gus and Jack love each other to death, but their arguments do get ugly sometimes. I pull three Old Peculiars out of the fridge (the shop is doing well enough for us to buy imported beer), and make turkey and Swiss sandwiches.

I return to the living room, and find Gus in a zombie-like state, his eyes glued to the TV screen. The game is not on yet, and they are watching the news. The headline reads "Locusts Nix Cricket".

"This week's cricket fixture between Wales and Zimbabwe is cancelled due to the swarms of locusts that have been plaguing southern Africa since the dry season began," says the British announcer. "Virtually every available country club has been infested by the ravenous pests looking for anything edible after devastating tobacco farms throughout the region."

"Buck up, son," Jack says. "The game will come on in a few minutes."

Gus's blank look focuses on some point in space, and his eyebrows make their deep-in-thought scrunch.

I give Jack his sandwich and beer, and hand Gus his sandwich. I take a big swig of his beer before surrendering it. "What's wrong?"

Gus does not miss a chance to editorialize. "In the age of global travel, it's only a matter of time until they make it across the Atlantic."

I laugh. "What, cricket, or the locusts?"

"Locusts."

"You mean some terrorist will smuggle a hungry swarm in his luggage?"

"Not necessarily. Doesn't it strike you as odd that this swarm has a very uncharacteristic dietary preference?"

"You mean those things will get to the U.S. and devastate all the tobacco crops?" Jack jumps up and paces around, all of his six foot two expressing a great anxiety. "If they raise the smoke prices again, I'm going to be mad."

"What if there are no more smokes?" I

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say.

I've never seen Jack in such a state of upset—he goes from purple to ashen in a matter of seconds. "I'm going outside for a smoke," he says, and strides out on the porch until the sound of cheering crowds from the TV gives him something else to be mad about.

Gus watches the game, but doesn't join his dad in the ceremonial tirades. His eyes keep straying to the window, as if he expects the plague.

I have almost forgotten about the locusts until some guy from Washington, D.C. calls Gus and invites himself up for an official visit. It sounds urgent, and I cannot imagine what he might want. Two men come to Snakes and Things at our convenience, and we go to the back room for privacy. They are wearing dark suits, and show federal badges. One is carrying a large brown paper bag. Although they are very polite, my stomach begins to turn.

Gus hangs his head like a puppy and whispers to me, "I'm afraid I think I know what this is about."

"We're from the Department of Homeland Security," says Mr. Arnold, a suspiciously clean-cut man who seems too young to be a federal agent. "We need your help. May we talk in private?"

"We are in private," Gus says. "I don't do anything without Jessie's ultimate approval." Here we go again. Whatever happens, it will be my fault.

"All right," Arnold says. "We've already taken the liberty of checking her background." If I disliked these Men in Black at first, now I really hate them. Arnold throws me a fake courtesy smile, then turns to Gus. "We'd like to ask you a few questions about an acquaintance of yours, Dr. Daniel Ulm."

Gus looks pale as he nods. My head grows hot. I knew that Dr. Ulm was bad news. Now he's torturing us from beyond his freaking grave. I glare at Gus, and more color drains from his face to mine.

"You worked with Ulm last year."

"I gave him some general advice, is all." Gus fidgets, and the Men in Black pick up on it.

"How much do you know about the locust project?"

"Nothing."

"What exactly did you do for Dr. Ulm?"

"I helped design a non-excising eukaryotic vector."

The Men look at each other gravely. "That's all? Not the locusts?"

Gus nods. "I swear."

Arnold looks intently at Gus, then relaxes. "All right, Mr. Lanley. But perhaps you can still help us. Show him the bugs."

Arnold's goon opens the brown paper bag. Inside is a SpongeBob SquarePants lunchbox. I laugh out loud, and Gus smiles and breathes easier. "I like your cover," he says.

"My kid's," says the goon with a straight face. He opens the box, and inside is a specimen bag.

We lean over. There's a pair of dead grasshoppers inside.

"How nice of you to bring lunch for the geckos," I say.

"Funny," says Arnold without humor. "I like that."

"I'm no entomologist," says Gus. "What are they?"

"*Nomadacris septemfasciata*. Red locusts."

"They're not very red," I say.

"You should see them while they're swarming. One of these specimens was collected in Zimbabwe, where the species is native, and the other was found in Kentucky, where it is not."

Jesus. Gus's plague scenario suddenly comes back to me. The bastard suspected it all along.

"Swarms of red locusts have recently devastated millions of hectares of crops across southern Africa."

Gus tightens his lips. "Tobacco."

They look at him as if they're going to clap him in irons. "Now just how did

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you know that, if you weren't involved?"

"I saw it on TV. So now red locusts have been introduced into Kentucky?"

"Yes. This one is young, and not yet in the gregarious phase, but we're afraid that if there are enough of them they'll begin to swarm. And these aren't ordinary red locusts. We think they were genetically engineered to feed on tobacco, and it's no coincidence that they appeared just where they did. I got no soft spot for the tobacco industry, but if you think about the effect on the economy. . . ."

Gus nods. His gears are turning. This is not good. "What about pesticide?"

"They are resistant."

"What you need," says Gus, "is some kind of biological vector to kill the locusts. Fight a plague with another plague, so to speak."

"We thought about Green Muscle, a fungus that kills locusts, but it's too slow, and we don't think it would survive conditions in the U.S."

I'm not a happy camper, but I can't resist: "What if we unleash all of our geckos?" I immediately regret saying it, because Gus slaps his hand on an aquarium, scaring the fish.

"Birds," he says. "It has to be birds."

"Can you do that? Will you help us, Mr. Lanley?"

Gus sighs and nods grimly.

"What the hell?" I shout, after the Men leave. "You're not seriously thinking of releasing some transgenic birds on the farms of America, are you? Last time it was the bonsai dolphins, and they're still cleaning up after that one."

"I know," Gus moans.

"Besides, I don't see how it could work. How can you breed enough birds to stop a plague that's probably already in progress?"

"That's an excellent point. Still, I have to do something."

"The tobacco crops are not your responsibility, despite the cost of Jack's habit."

"Jessie, I think I caused this mess in the first place. If Ulm had it in for the tobacco industry because of his health problems, what better revenge than to destroy tobacco in biblical proportions? And to think, I helped him do it—this is what he needed the eukaryotic vector for."

To my chagrin, Gus works intensely on the project for a couple months. The government is going to fly us to Kentucky, but Gus goes early. I miss him, but mostly worry that he's losing to the dark side. I try to lose myself in long hours at the lab where I work, but I am tired of training cancer cells to do tricks. The only one they do well is to play dead. Then when no one is looking, they jump up and multiply like bunnies.

Working evenings and weekends in the shop is even less productive, because I have a way of scaring away the customers. They're always disappointed when Gus isn't there, since he is more often the reason they come than to actually buy merchandise. One Japanese regular even leaves a large gift that he wanted to give to Gus personally.

"Aw, Mr. Gus not here?" he says, crestfallen. "Two weeks, not here?"

"I'm sorry, Mr. Matsumoto," I say. Matsumoto spends a lot of money in the shop when he's in the country marketing his electronics, and he really can be sweet. "I'm going to meet him tomorrow, and I'll give it to him."

Finally, I arrive in Kentucky, and go find Gus. He's in a lab at the University of Kentucky, but it looks more like our pet shop would look if Gus suddenly developed a great passion for birds. There are hundreds of cages of them. Apparently, the FBI has raided all the neighborhood pet shops and garbage dumps, and I'm staring at an interesting and eclectic assortment of canaries, budgies, and pigeons.

Instead of kissing Gus hello, I point my finger at his chest. "What the hell are you doing to the poor little birdies?"

He tries to hide a syringe behind his back. "Nothing."

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"What sort of nothing?"

He sighs. "The same nothing Ulm did to the locusts. The suicide virus was used to deliver the resistance genes into the locust cells. I'm doing it with birds—if it works, they'll be immune to tobacco alkaloids, and will be able to gobble up all the locusts with impunity."

I make a small, annoyed noise. Fire with fire, that's Gus's motto. "How's it going so far?"

"Not so good," he says. He sits down on the lab bench, his legs dangling. "Awful, in fact. It doesn't take. I know nothing of the bird genome, and there are practically no maps available."

I nod. To insert a gene, one has to have at least an approximate idea of where it is supposed to go. "So what happens to them?"

Gus gives me a grim smile. "Most die. Some develop tumors."

I take him by the hand. "Let's go to the hotel," I say. "I'm tired after the flight."

By his eyes I can see that he's tired too.

Two days go by, and we barely leave our room. I guess that Gus has given up on his birds, and is too depressed to think of something else. The country will be ruined, and there he lies, watching cartoons, while it's all his fault. Never again, I think, never again. If Gus messes up like this again, fine. I won't be there.

Mr. Arnold finally catches up with us, and Gus just stands at our door blinking.

"How goes it?" Mr. Arnold asks.

"Ulm was really a brilliant son of a bitch," Gus says.

"He took everything into account when he altered those African locusts. Climate differences, predators, microorganisms. He'd been working on it for years." He sighs. "I guess it might work with birds, but it'll take years. Decades. And I can't do it all by myself." He cracks a smile. "To quote any scientific paper, 'More research is needed.'"

"We can't wait that long. The effect on the economy will be catastrophic," Mr. Arnold says. "It'll start with the tobacco companies finally going under, several states going bankrupt, sea changes in business. . . ."

Arnold leaves, and Gus takes my hand. I'm pretty cold to him. He was too good to be true when it was just us and our pets, but the laboratory has finally done him in, and now we're sitting in some creaky dive surrounded by government men. Gus's eyes grow distant, and his chin quivers. "This time it just isn't my fault!"

I step back and jab a finger at him. "Oh, yes it is," I say. "You think genetic engineering is the answer to everything. You're the hammer that thinks everything around you is a nail. Or the jogger that thinks he can cure world hunger if enough people jog with him. Well, I've got news for you. Science is better at uncovering great conundrums than at solving them. You said as much in that keynote speech that got us into this mess in the first place. What's important is what questions to ask, you said. Why did you bother asking *this* question when you already knew the answer was no good?" Jesus, what a hypocrite.

Gus sits and puts his head between his knees, cupping his head in his hands. "You're right." He looks up. "You're right. I didn't even know what question Ulm really had in mind."

"The goal here is to deflect an ecological disaster, and protect the economy, right? Just because Ulm used state-of-the-art science—which you pointed him to, by the way—doesn't mean the solution has to be the same."

"There was no way we could stop this train," Gus says, "once the wheels were in motion."

"You know what? These insects ripped a swath through Africa, where the economy was already a mess. I'll bet that they have all kinds of solutions."

"No, they don't." He gets up, swatting a locust that flaps onto his chest. "Who let that in here?"

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"Ulm."

Gus looks grim, but no longer defeated. "Hey Jess . . ." Uh-oh. I know that smile. "How would you like to get away for a while?"

"Sure . . ."

"We could use the rest of your vacation to go see how the Africans are solving this problem. There's a lot of creativity in their agricultural programs, I understand."

You'd think he would at least give me credit for the idea.

I hate long flights, but two red-eyes in a row are worse. We have a day to kill in London, and Gus drags me into town to meet an uncle and several cousins in a questionable pub. They are charming, but I'm too sleep-deprived to enjoy the visit. Then we rush back to the airport for the flight to Zimbabwe.

There is a long line to get through security at the Harare airport, and it doesn't help that a Dolly Parton song is playing over the loudspeaker. The crush of people through customs in stifling, the heat is annoying, and whatever thrill of exotic travel I should be feeling is stolen by jet lag.

Finally, we get a taxi. The driver is a big African with a very round head. With a sparkling grin he introduces himself as "Funny Boy."

"What's your real name?"

He looks offended, but I'm not sure. "Funny Boy is my real name."

Gus just grins back. "Well, Funny Boy, how would you like a private charter?"

"Oh, yes, I can do that! Happy to do that. Where do you need to go?"

We study our notes, but cannot pronounce the place.

"Chisumbanje Estate," says Funny Boy. "I know it. My wife's family is just near."

"Is it far?"

"Ahhh!" he says in a falsetto, like a mock scream. "Very far. Drive all day."

The drive is glorious, mostly because it is all new to me. The Sun seems to streak across the land in any direction it wants, as unaware of the time of day as I am. The land itself is rocky and rolling, with formations that remind me of some bizarre science fiction set. I hate to blink, hoping to catch a glimpse of some wildlife, but once we are into the real country, all we see are cattle and goats. At dusk we cross a big river, and we do see some impala.

It is dark when we arrive, and it is hard to find the estate because Funny Boy's headlights are out of alignment. Gus is feeling carsick, and I'd be really mad if I were driving, but Funny Boy acts as if being lost in the dark in the middle of nowhere is really fun. Finally we see the sign, and I'm determined to pronounce the name.

"Chisumbanje. What does that mean anyway?"

"You know, it's quite humorous," he says. "I never thought about it, but it means to tie up a piece of marijuana."

Gus laughs, feeling better now that the car has stopped. "Get it, Jess?" he says. "We're at a government-sponsored agricultural research station, and it's name means 'roll a joint'!"

I take in a breath. "Do they grow a lot of marijuana?"

"Ah, no! Very illegal," Funny Boy says happily.

We are expected; a friend of a friend had spent eight years doing a doctoral thesis at this place, and he referred us to an African friend of his, Dr. Dearborn Gwati. He shows us to a decent wood-paneled room in a guesthouse, and leaves us. A man brings tea, and I wonder where Funny Boy will sleep. In the morning we have a regular continental breakfast with the rail-thin Gwati. Like the tea, the coffee is grown locally, and it's superb.

"Has the swarm been here yet?" I ask.

"It will come," Gwati says with authority. He speaks the Queen's English, and is a rather dramatic man, enunciating even the most mundane words with great flair. His left hand is always opened

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flat, but his arm gives it such rich gestures that I can't begin to understand their subtleties. His buttoned three-piece suit adds to the effect, and I marvel that he doesn't look uncomfortable. "If it isn't the quella-quella birds, it's the locusts."

"Tell me everything you know about the red locust," Gus says.

"Some of us eat them by the bag. They are used to cure a rapid heartbeat by making little cuts on the chest and letting the locust drink blood from it." Gwati laughs. "Of course, the buggers devastate our crops as well. Did you know that we grow more Virginia tobacco in Zimbabwe than you do in Virginia?"

We learn more than we wanted to, and Gus nods, quietly, except when he sips his coffee. I'm staring at the Sun-baked green fields, mesmerized by the hundreds of water arcs shooting across them in patterns from irrigation pipes.

Gwati shows us around. Funny Boy joins us, explaining that he had spent the night with relatives nearby. We follow a series of concrete irrigation canals. There's been a drought for years, and the water is pumped from what amounts to wet sand in a nearby river.

I don't know whether to be confused or smug. "I don't see any tobacco."

"Here we grow mostly cotton, wheat, and sugar. Soon we will be milling more sugar than Hippo or Triangle."

"Nothing else?"

"There are a few vegetables."

Gus stops striding and pulls his hands from his pockets. "That's odd," he says. "I was directed here specifically to have a look at the effects of the locusts on tobacco."

"Well," says Gwati, "the locusts did come through, but there is no tobacco here."

A man runs up to us from a nearby office. "The swarm is coming!" he says.

"Now?"

"Yes, sir!"

Dr. Gwati paces quickly after the man, and we rush to keep up.

"I thought you just said the locusts had come and gone," Gus calls.

"Yes," he replies over his shoulder. "Come and gone. But these are not locusts."

"What are they?"

Gwati escapes into an office, and we do not presume to follow. Funny Boy takes charge of us. "They are quella-quella," he says. "Birds. Flocks of millions. They can destroy a field just like that."

Great. More plagues of Moses, and we're following them around the planet. I hope this one isn't homemade. "What should we do?"

"Come with me," says Funny Boy. He drives us down one of the wide, deeply rutted dirt roads that borders a cotton crop.

I am at a loss, and I'm afraid Gus is too. "You know," he says, "we came here to learn, not to lead. But I wonder where he's taking us."

Funny Boy overhears. "To the tobacco."

"Dr. Gwati says there isn't any."

"Not on the government part of the estate. But there are 400 hectares of small parcels, mostly subsistence farming. I saw tobacco growing on the way to my family's home."

Growing. He did say growing, and that's what we find, only the farmer won't let us in. Across a wire fence, amidst his healthy-looking tobacco plants, the short man with a rounded forehead looks positively terrified. Funny Boy talks to him for a long time, and I hear the drone of the quella-quella coming closer. At length, our driver returns.

"He's afraid of the birds?" I say.

"He is afraid of you."

"Why?"

"Ah, let me go and ask him. Just wait here."

It turns out that white people never visit these little co-ops, and the farmer is afraid we will somehow get him into trouble. At length, Funny Boy convinces him that we are just interested in why

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the locust swarm passed over his tobacco. The farmer, who doesn't speak English, goes on and on about something with great excitement, and leads us to another tobacco patch. This one has been completely devoured.

"Let's cover up the good ones," says Gus, "before the birds come. I want to take some specimens."

Funny Boy explains, and the farmer digs up a couple of plants that are about a foot high and presents them to Gus.

"I've got to bag these," Gus says. Funny Boy translates, and the farmer leads Gus away to find something suitable to contain the plants. I know what Gus wants to do. He wants to fondle their DNA.

"We should find shelter," Funny Boy says to me.

"Listen," I say, following him out of the field. "Can you do me a favor? When he gets back, ask that man why he thinks the locusts passed over those plants. Maybe he knows."

"Yes, I will do that."

I do not see Gus again until after the birds. They churn through the air like fire in a tornado, land everywhere, eat everything. There are so many of them that I can't see through them, and they occasionally collide, killing each other in a frantic search for food. The screeching is ear splitting, even through the window.

Luckily, they do not stay long. Soon, the last of them has gone. So is the last of the tobacco. I don't think that will sit well in their stomachs, but with the drought, and the locusts preceding them, what else could they do? They even tried to eat the trees.

After they are gone, Funny Boy talks with the farmer. We have all gained his trust, and we squat in the field, running soil through our fingers.

"Well," Gus says, "I guess I should try breeding plants for a change. These babies are obviously resistant to locust, so let's see if we can crossbreed them with tobacco at home."

I give him a suspicious look. "You don't want to know which gene makes them resistant?"

Gus shakes his head. "Couldn't care less. Selective breeding is the way to go—this is what the farmers have been doing for millennia. I am starting to think that they had a point."

"You know," I say, "I'm no anti-smoking Nazi, but maybe America would be better off without tobacco."

Gus laughs. "Who are you, Dr. Ulm? You can't possibly believe that we should choose for people whether they can smoke or not."

I inhale and look at Gus squatting and squinting. He's dirty, and the rolling Sun is turning him orange. Yes, there have been times when I've been furious with him for sticking his nose where it doesn't belong, but I also know that he has been struggling with a vicious personal demon. I think he just kicked its ass.

The farmer with the rounded forehead pulls out a pack of cigarettes and offers us each one. We decline.

Funny Boy surprises me again by lighting up what smells like a reefer. I recall the name of this place. "Very illegal," he says.

We go home by way of Kentucky, bearing gifts. Dr. Gwati has pulled some strings, and he arrives there too, to finalize an agricultural cooperative deal with the University of Kentucky. We shake hands. That handshake brings some of the African sun with it.

Then our Man in Black catches up to us.

"Why didn't I know about all this?" says Mr. Arnold.

"It's not Homeland Security," Gus says with a smile. "It's the Department of Agriculture."

"Son, you're a son of a bitch."

I laugh out loud.

Gus and I stay for two weeks, during which Dr. Gwati flies in some colleagues, and everyone gets to work. I'm happy because Gus is nowhere near a sequencer. The Kentuckians find some-

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thing strangely compelling about the African jit jive music someone brought. I don't know what the attraction is, but I guess the jangly sound reminds them of banjoes. I recall that Country was popular in Africa too. It all makes my hair stand on end.

I arrive home from work late, partly because I am still catching up, and partly because I had to stop by Snakes and Things to tend to the animals. I'm huffing under the big box that Matsumoto left for Gus. Gus is on the couch, too sick to work at the shop.

"Can I kiss you?" I ask, afraid of germs.

He's gloomy, but says, "Go for it."

I kiss him warily. "What did the doctor say?"

"Malaria. With everything going on, I forgot to take my prophylactics."

"You idiot," I say. I wipe sweat from his forehead into his hair.

"If it isn't locusts or birds, it's mosquitoes," he says. "What's in the box?"

"Gift from Mr. Matsumoto."

I help him open the box. It is one of the electronics Matsumoto's company sells. I set it up on the patio, wishing we'd had the thing in Africa.

Gus joins me. A mosquito wends its way toward him, but detours into the contraption. With a flash and a zap, the bug is gone.

Gus smiles at the irony. "Bring 'em on." ■

(EDITOR'S NOTE: Jessie and Gus appeared earlier in "Alphabet Angels" [March 2005] and "Smiling Vermin [May 2005].)

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From Fimbulwinter to Dante's Hell: The Strange Saga of Snowball Earth

Richard A. Lovett

Once upon a time, there was a planet. It was a happy place, as planets go, with sapphire seas and swirling, white clouds. Then the climate cooled. Snow fell in places where it usually didn't and failed to melt in places where it usually did. Pack ice formed on once-temperate seas. The snow and ice reflected sunlight back into space, and the temperature ratcheted down another notch, and then another, as the ice advanced from the poles toward the midlatitudes.

It was by no means the first time this had happened, but always before, the ice had stalled, hesitated, and retreated. This time, it continued to advance, gaining momentum as the planet's albedo—the fraction of incoming sunlight it reflected back into space—rose ever higher. And then, catastrophe. The ice reached a critical latitude—roughly equivalent to Southern California—and the albedo effect escalated until the planet was covered with ice from pole to pole. Average temperatures hovered around -60°F—colder at the poles, not so cold at the equator. Rain ceased. Snow nearly did, too, although flurries still fell, condensing from moisture that sublimated from the relatively warm equatorial ice.

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If this world was once alive, it was now virtually dead. The once-happy planet had become a permanent ice-house, home only to a few bacteria that managed to eke out a living in the interstices between ice granules. It was so cold that nothing could re-thaw it until its sun grew old and began expanding into a red giant star, hot enough not only to dispel the ice, but soon thereafter to reduce the entire world to slag.

This sad little tale stems from a climate model developed in the 1960s by Mikhail Budyko of Leningrad Geophysical Observatory, who observed that if glaciers spread too far toward the tropics, a runaway albedo effect would send the planet permanently into the deep freeze. It was a model that spawned a flurry of space-exploration stories in which starfaring archeologists come upon such planets, finding the remnants of some brave civilization's desperate last stand against the ice. In one story I read in high school, alien explorers eventually discover that the stricken world is our own Earth.

But the model appeared to have no practical ramifications. If, for a science fiction story, you want to create *Fimbulwinter*, the cold hell that in Nordic myth preceded the end of the world, a runaway albedo effect is certainly a great way to do it. But everyone presumed that the real Earth wasn't prone to such catastrophes or one would already have happened and we wouldn't be here to write stories about it.

Then something funny happened. For years, geologists have known that the Earth has seen some large ice ages in its distant past. Outwash deposits from ancient ice sheets have been found in areas as disparate as Africa, Death Valley, and Australia. By the mid-1960s, W. Brian Harland of Cambridge University had identified such deposits on most continents, dating many of them to the Neoproterozoic Era, which ran from about 800 million to about 600 million years ago. Superficially, it looked as though the Neoproterozoic had seen the mother of all ice ages. But for years, most scientists presumed that this was an artifact of continental drift. Once the continents' wanderings were fully understood, they figured, it would be discovered that the glacial deposits had been laid down at times when the region in question had been in the far north or south. After all, everyone knew that the only glaciers that exist in the tropics are small ones on tall peaks such as Mt. Kilimanjaro or the Peruvian Andes. The fact that these deposits seemed to have occurred virtually *everywhere* in the Neoproterozoic was a nagging mystery, but not one that drew much attention.

Then in 1992, Caltech geobiologist Joseph Kirschvink wrote a two-page paper for an obscure scientific monograph, in which he argued that those deposits really meant what they implied. Budyko's catastrophe had actually occurred, creating conditions that Kirschvink colorfully dubbed "Snowball Earth."

Interest in Snowball Earth didn't really take off, though, until Paul Hoffman of the Department of Earth and Planetary Sciences at Harvard University refined the theory in a 1998 article in *Science*.[1] Since then, the evidence has mounted that Hoffman and Kirschvink are right, and that the Earth went through a snowball state at least twice:

[1] In his book *Scatterbrain*, Larry Niven says that this article inspired portions of his first collaboration with Brenda Cooper, a novelette called "Ice and Mirrors," set on a snowball world (not Earth). Hoffman's original article is "A Neoproterozoic Snowball Earth," Paul F. Hoffman, Alan J. Kaufman, Galen P. Halverson, and Daniel P. Schrag, *Science*, 28 August 1998, pp. 1342-46. For non-geochemists, it's tough going. For more accessible summaries, *see*:

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once 750 million years ago, and again 580 million years ago. Hoffman thinks it happened twice again, at intermediate dates, but the evidence for this is weaker.

The Big Melt

The moment you start taking Snowball Earth seriously, you immediately bang into the main obstacle to Budyko's original model. The albedo effect of planet-girdling glaciers is extremely strong. In his 1992 paper, Kirschvink had to address one crucial question: What melted the ice?

The answer turned out to be a climate factor overlooked by Budyko: carbon dioxide.

Anyone who's paid attention to today's global warming debate knows that carbon dioxide is a greenhouse gas that warms the planet by trapping heat in the air. In the era before fossil fuel burning, the primary means by which it entered the atmosphere was from volcanic eruptions. It left by dissolving in rainfall to form carbonic acid that reacted with certain types of rocks, specifically silicates and carbonates.

During the Snowball, volcanoes continued to erupt, melting holes in the ice through which carbon dioxide spewed into the atmosphere. But the Snowball largely, if not totally, shuts down the carbonate and silicate weathering cycle. The rocks are sealed off by all that ice and snow, and even if there are gaps in the ice, the weathering process is temperature-dependent, proceeding much more slowly under Snowball Earth conditions. Not to mention the fact that there's no rain to bathe weatherable rocks in carbonic acid.

Today's volcanoes produce about half a billion tons of carbon dioxide per year. If Neoproterozoic volcanism proceeded at the same rate, Hoffman estimates that it would take about four million years to accumulate enough carbon dioxide in the air to reverse the Snowball. If the weathering cycle isn't completely shut off, or if there are cracks in the sea ice that allow some of the carbon dioxide to dissolve in the ocean, the atmospheric buildup will be slower. In his 1998 article, Hoffman estimated that the build-up would take nine million years, but noted that it might take as long as thirty million.

However long it takes, the critical value for the amount of carbon dioxide needed to reverse the Snowball is about 120,000 ppm. In other words, to end the Snowball, the atmosphere had to have held 12% carbon dioxide—a level that's hundreds of times higher than those that have us concerned today!

Once the Snowball started to melt, it must have melted fast—so quickly that *all* of the ice may have been gone within a few hundred years. Meanwhile, all of that carbon dioxide was still hanging

1, con't • "Snowball Earth," Paul E. Hoffman and Daniel P. Schrag, *Scientific American*, January 2000, pp. 68-75.

• "An Appealing Snowball Earth That's Still Hard to Swallow," Richard A. Kerr, *Science*, 10 March 2000, pp. 1734-36 (a news feature written to non-specialists);

• "The Longest Winter," Gabrielle Walker, *Natural History*, April 2003, pp. 44-51; and

• "Ice Magic," Gabrielle Walker, *New Scientist*, 12 April 2003, pp. 30-34.

Much of the information in this article comes from these sources, plus a lively debate between Hoffman and his critics that appeared in the Letters section of *Science*, and a follow-up symposium on Snowball Earth at the joint meeting of the U.S. and Canadian geophysical unions, May 17-21 2004 in Montreal, Canada.

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around, with no gigantic albedo effect to offset its warming potential. In the blink of a geological eye, the Earth didn't just rebound from the Snowball: it overshot, increasing its average temperature by approximately 180 degrees, from—60°F to 120°F. Goodbye icehouse, hello steamhouse. Hoffman says that Dante would have been proud.

Death of a Supercontinent

The weak link in this theory is the question of what might have started the runaway glaciation. Earth has seen many ice ages, but since the Neoproterozoic there is no evidence that they got out of hand.[2] What was different in that era?

One factor is that the Sun was weaker. Aging stars put out more energy than young ones, and 750 billion years is enough for the Sun's output to have intensified by 6%. But earlier in the Earth's past, the sunlight was weaker yet, and there is no evidence of prior Snowballs. Other factors must have been at work.

Hoffman and his colleague Daniel Schrag believe that one of these was the arrangement of landmasses. During the Neoproterozoic, most of the Earth's land appears to have been arrayed near the equator, where it would have had a quite different effect on climate than today's arrangement of continents. To begin with, land has a higher albedo than water. Under the intense sun of the tropics, that will have a greater effect on climate than when the land is farther north or south. In addition, all that equatorial land may have played hob with ocean currents, which today convey a considerable amount of heat from the tropics to the pole. Also, when glaciations begin on high-latitude landmasses, there is an immediate impact on the carbonate/silicate weathering cycle, as the ice covers weatherable rock. Thus, the moment a northern continent starts becoming glaciated, carbon dioxide begins building up in the atmosphere, helping to counteract the glaciation before it becomes extreme. In the Neoproterozoic, though, weathering would have continued unabated until the glaciers had reached the tropical continents, when it was too late for them to be halted by a small change in the carbon dioxide cycle.

Snowball critics haven't been particularly impressed by these arguments. But recently, an international research team led by French climate researcher Yannick Donnadieu, has added a new, much-stronger factor to the list. In a study published in *Nature* in 2004, Donnadieu noted that the first Snowball glaciation coincided with the breakup of an early supercontinent called Rodinia. Generally, the interiors of large continents are dry, like the steppes of Asia or America's western Great Plains. In a supercontinent, the interior may have been very dry indeed. When Rodinia started breaking apart, land that had once been in the interior became coastal, exposing a lot of previously unweathered rock to rainfall. Donnadieu estimated that this was sufficient to cause the Earth's atmospheric concentration of carbon dioxide to plummet from 1830 ppm to less than 250 ppm over the course of a few million years. That, he calculated, would produce a

[2] I originally thought that *only* in the Neoproterozoic had any of these ice ages gotten out of hand. But then I learned that there is at least one study that appears to have found a prior Snowball, 2.5 billion years ago. See D.A. Evans, N.J. Beukes, and J. L. Kirschvink, "Low-latitude Glaciation in the Paleoproterozoic Era," *Nature*, 1997, pp. 262-265. A detailed discussion of this discovery is contained in Walker's excellent book, cited below. And yes, that's the Kirschvink who first proposed the Snowball Earth theory. This older glaciation hasn't drawn much attention, but according to Walker's summary, the same forces appear to have been at work then as in the Neoproterozoic.

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global cooling of about 8°C (14°F)—enough to launch one heck of an ice age.[3]

Donnadieu's finding was immediately criticized by Nicholas Christie-Blick of Columbia's Lamont-Doherty Earth Observatory, who has been described as Snowball Earth's "Chief Unbeliever."[4] In a comment to *New Scientist* magazine, Christie-Blick pointed out that Donnadieu had explained only the first of the two putative Snowball Earth glaciations.[5] Donnadieu's mechanism wouldn't work for the second one, Christie-Blick said, because by that time, Rodinia had completely broken up, and none of the fragments were themselves disintegrating. It's a valid point, but prior to Donnadieu's study, nobody had a really good explanation for the start of *either* of the two major glaciations. Finding an explanation for one of them does nothing to weaken the theory.

Where's the Evidence?

Climate models are a dime a dozen. What makes the Snowball Earth model interesting is that there's considerable evidence it's correct. Unfortunately, some of that evidence is the type of thing that makes my English-teacher mother glad nobody ever forced her to take a course in geophysics: a nasty-sounding stew of terms like *paleomagnetism*, *cap carbonates*, and $\partial^{13}C$ *values*.

But the story starts simply, with a visit to one of the world's most exotic landscapes, Namibia's Skeleton Coast. That region, rapidly developing into a major tourist destination, is close to southern Africa's sprawling Kalahari Desert, although the arid lands of Namibia are called the Namib Desert.

Geologists love arid country because, in the words of some bygone geologist, the land isn't all "haired over" with plants, making it easy to see the underlying geology.[6] Add in some dramatic rock formations, and you have geologists drooling, right along with the ecotourists.

[3] "A 'Snowball Earth' Climate Triggered by Continental Break-up Through Changes in Runoff," Yannick Donnadieu, et al, *Nature* 18 March 2004, 303-306. Another factor is that the breakup of Rodinia was accompanied by huge flows of *flood basalts*—a type of lava that spreads across immense areas of land. The eruptions that produced these basalts would have caused a short-term spike in atmospheric carbon dioxide, but the enormous amount of fresh, easily weatherable rock would then have drawn more carbon dioxide out of the air than the eruptions injected into it.

[4] From *Snowball Earth: The Story of the Great Global Catastrophe that Spawned Life as We Know It*," Gabrielle Walker, 2003. For Snowball Earth junkies, this is *the* book, mixing an intriguing profile of the brilliant but irascible Hoffman with an account of the geological detective work that led him to become point man for the Snowball Earth hypothesis.

[5] "Splitting Continents Turned Earth into Ice," *New Scientist*, 20 March 2004, p. 14.

[6] This phrase may originate in one of John McPhee's geology books, perhaps *Basin and Range*, which is one of the finest science books ever written. Or I may have picked it up from any of the many geologists I've known over the years. Geologists are often environmentalists, but rarely tree-huggers, and they are the only people I've ever met for whom "roadcut" is a verb: as in, "Let's go roadcutting this weekend up in Biting Fly County." (The term refers to looking at outcrops revealed by roadcuts, not hacking new highways into the wilderness!)

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There are lots of things to study on the Skeleton Coast, but the ones that have caught the Snowball Earth theorists' eyes are the Neoproterozoic glacial deposits.

We noted earlier that these deposits occur worldwide. But they are particularly well studied in Namibia, which Hoffman has been traipsing since 1993. It was Namibia that provided the clues that caused him, five years later, to launch the Snowball Earth theory into the limelight.

Seven hundred fifty million years ago, that part of Namibia was submerged beneath a shallow tropical sea, which means that it was accumulating sediments throughout the critical Snowball Earth period. One layer is a gray siltstone: a type of stone formed from muddy seabed. Siltstones aren't unusual, but this one is peppered with rocks of all sizes, ranging from pebbles to boulders, and varying widely in composition.

The question is: how did all of these rocks get into a muddy seabed? Hoffman's answer: they floated out to sea in icebergs that calved off of a disintegrating glacier. As the icebergs melted, the rocks, called *dropstones*, fell out of them and sank.

These, in fact, are the types of features that led Harland to start cataloging glacial deposits all those years ago. An alternative theory is that these jumbled deposits were created by submarine landslides, but there are subtle differences between landslides and ice-rafted debris, and even Snowball Earth's harshest critics generally accept that these deposits are indeed glacial.

The next question is determining the latitude at which they were created—something geologists refer to as their paleolatitude (*paleo-* meaning "old").

In theory, this is easy. In practice, it isn't. The technique hinges on the fact that the Earth has a magnetic field. When siltstone forms, magnetic particles in the mud line up with that field like tiny compass needles leaving a magnetic imprint on the rock. Near the poles, the magnetic field has a strong up-and-down component. Near the Equator, it runs more closely parallel to the Earth's surface. The angle at which a rock is magnetized should tell you the latitude at which it was formed.

That's the theory. The reality is that the passage of time is extremely good at scrambling the magnetic signal. Whenever geological processes melt or partially melt a rock, it becomes remagnetized, carrying the magnetic signal of the latitude at which it resolidified, not the one at which it originally formed. In addition, water percolating through porous rocks can contaminate them with new magnetic particles whose orientation reveals the latitude at the time *they* were deposited.

In 750 million years, a lot of rocks get remagnetized. In 2000, Dave Evans of Yale University reviewed the data from eighty-five Neoproterozoic glacial deposits. Only sixteen carried enough residual magnetism to allow *any* meaningful guess as to the latitude at which they were formed. Of these, nearly half provided paleomagnetic data that was at best "poor." In 2004, he updated his review to include additional deposits, but the upshot remains the same: a lot of the paleolatitude data is at best questionable.

But—and this is a huge "but"—among the deposits for which the paleomagnetic data is strongest are ones that appear to have been formed very close to the equator. Included in that list are the deposits in Namibia, but the most impressive are ones in Australia, originally studied by Snowball Earth critic Christie-Blick.

In 1999, Christie-Blick and colleagues reported that samples from the Australian deposits record not only low-latitude magnetization, but at least three polarity shifts in the Earth's magnetic field (which occur at erratic intervals on the order of tens to hundreds of thousands of years). If these sediments had been remagnetized, the entire deposit

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should have been remagnetized at the same time, wiping out any trace of these magnetic flip-flops. The fact that this has not happened is strong evidence that they retain their initial magnetism. Christie-Blick may not believe in the Snowball, but he does agree that the Neoproterozoic saw big glaciers in the tropics.

Tropical glaciers indicate a massive ice age, but not necessarily a planet-girdling one. Nick Eyles of the University of Toronto argues that to the extent we really are seeing glacial deposits, they're from regional glaciations caused by tectonic uplifts that created tall mountains as the Rodinia supercontinent "unzipped."

One difference between regional glaciation and the Snowball is that limited glaciation wouldn't shut down the silicate and carbonate weathering cycle. That means that there would not be a severe hothouse overshoot following the defeat of the glaciers. The difference is critical because the Snowball model predicts that as the world shifts from cold-and-dry to hot-and-steamy, the air remains dense with carbon dioxide. At the same time, rainfall increases, bringing huge amounts of dissolved carbon dioxide into the ocean, along with the byproducts of carbonate and silicate weathering.

If you're a geochemist, this scenario is the stuff of multiple Ph.D. dissertations. When all of that carbonic acid hits the ocean, it's going to react with minerals such as calcium, and precipitate to the sea floor as carbonates. One consequence is that the hothouse will come to a rapid end. Another is that these carbonates should still be present as massive quantities of limestone.

And that is exactly what we see. Above the gray siltstones of Namibia and other Neoproterozoic glacial deposits lie thick layers of limestone, now referred to as *cap carbonates*. They are unusual rocks. In his 1998 *Science* article, Hoffman calculates that the Namibian cap carbonates accumulated at the staggering rate of forty centimeters (about sixteen inches) per year, producing beds that are tens to hundreds of meters thick. Overall, he adds, there was enough excess carbon dioxide in the air to blanket the entire planet in five meters of limestone, although precipitation would have been primarily confined to shallow-water coastal regions such as ancient Namibia.

More geochemical evidence comes from unusual iron deposits laid down during the Snowball epoch.

Iron enters the ocean from undersea hot springs. Early in the Earth's history, before there was oxygen in the air, oceanic iron concentrations were quite high. Then, photosynthesizing plants began creating oxygen, and the iron was converted to insoluble iron oxides, which precipitated out to form deposits called redbeds (for which we modern humans should be immensely grateful because they provide our best sources of iron ore). But all of that oxygen meant that iron no longer built up to high levels in the water. Subsequent sediments still contain iron, but generally it is dispersed throughout them at low concentrations.[7]

The exception to that "generally" is a brief interval of the Neoproterozoic, when the redbeds mysteriously reappear. For years, geologists were mystified, but the Snowball provides a simple answer. During the Snowball, the oceans were cut off from the air and from sunlight for oxygen-producing plants. Oxygen remained in the air, but in the water, its concentration dropped. Iron, on the other hand, continued to enter the water, and its concentration began to mount. Then the Snowball ended, oxygen returned to the ocean,

[7]"The Fifth Biorevolution," Stephen L. Gillett, Ph.D., *Analog*, September 2004, pp. 32-42.

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and the iron abruptly precipitated out. Almost by accident, the Snowball theory explains yet another geological mystery.

The final question is how all of this affected life. Initially, Hoffman argued that life suffered dramatically—just as one might expect. The evidence for this was based not only on the apparent deoxygenation of the ocean, but on the ratios of carbon-12 to carbon-13 in carbon-containing marine sediments, called carbonates, laid down just before the Snowball sealed the oceans.

Carbon-12 and carbon-13 are both stable isotopes (unlike the radioactive isotope, carbon-14, used for "carbon dating"). The Earth contains them in a fixed ratio, but biological reactions tend to work slightly better with the lighter isotope. The result is a fractionation process in which biological processes such as photosynthesis exclude some of the carbon-13 (producing products that are carbon-13-depleted), while nonbiological processes do not do so. It's complex, because different processes do this to different degrees, but for our purposes, what it means is that the relative amounts of carbon-12 and carbon-13 in any carbon-containing substance is an indicator of the role life played in its formation.

In some cases, the result is dramatic. Compounds like methane, for example, can be formed biologically (e.g., as swamp gas) or geochemically (as natural gas). Even though carbon-13 comprises only about 1% of the total supply of carbon, the difference between biologically produced methane and nonbiologically produced methane is measurable.

Although carbonate sediments can be formed biologically (from seashells accumulating on the seabed) the Snowball Earth carbonates were formed by processes that did not directly involve life. Nevertheless, life plays a role by "raiding" some of the carbon-12 from the ocean's store of dissolved carbon dioxide. This leaves less carbon to accumulate in inorganically formed carbonate sediments. The difference between these sediments' carbon isotope ratio and the planetwide average, called the $\partial^{13}C$ ratio, is a reflection of the degree to which biological processes have been at work in the ocean as a whole.

The scientific literature on this subject is a nightmare to the layman. But the basic point is that Hoffman initially argued that inorganic carbonates laid down just before the Snowball were unusually low in ^{12}C, indicating that life was already having a hard go of it. Christie-Blick's team came at him with a vengeance, arguing that they'd found carbonate sediments laid down *during* the Snowball whose $\partial^{13}C$ ratios indicate that, actually, it was business as usual for photosynthesizers. For a moment it appeared that the Snowball was on the ropes. Then Hoffman and Schrag took a careful look at marine chemistry under Snowball conditions and concluded that odd (and complex) processes at work under these conditions would affect $\partial^{13}C$ ratios in ways that would mimic the activity of life. Suddenly, the Snowball was back in business.[8]

By 2004, the question appeared to have crystallized into a war of competing snowball visions. Anti-Snowball arguments are based on poking holes in an extreme snowball theory in which the Earth is a "hard" iceball, with no open water whatsoever. People who don't want to believe this propose a model that's closer to a slushball than an iceball, with the ice not quite reaching to the equator.

The slushball solves a major problem with some of the Snowball deposits. In a hard iceball, the Neoproterozoic glacial deposits should have been laid down quickly, during the Big Melt, and there should only have been one such melt per Snowball. But that's not what the data show. Christie-Blick's Australian deposit were laid down over a long enough interval to preserve several magnetic flip-flops, and a 1,500-foot-thick deposit in Oman appears to have been

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created in multiple cycles of glacial advance and retreat.[9] A slushball Earth provides a mechanism by which this could happen.

Hoffman has modified his snowball theory to include slushball elements, such as thin ice at the equator and open-water leads that allow sunlight to reach photosynthesizers. Other refugia might have included surface-level hot springs and undersea hydrothermal vents, plus open-water rifts created where ice flows along the margins of continents or bumps into islands. In addition, climate models have revealed that even a fairly hard Snowball has exaggerated seasons producing strong winter/summer temperature variations even in the tropics. These might have been large enough to produce cycles of glacial surge and retreat that could explain the thick Oman and Australian sediments. All told, it's been a case of point/counterpoint in which the Snowball has, to date, held its ground.

Ediacarans, the Snowball, and Us

Snowball aficionados argue that the Snowball—or more precisely, the final snowball (580 million years ago)—is what created life as we know it.

Before that time, life wasn't really all that interesting. All that existed were bacteria and algae, which lived in colonies that Gabrielle Walker, author of *Snowball Earth: The Story of the Great Global Catastrophe that Spawned Life as We Know It,* colorfully describes as "Slimeworld." Then, something changed. Single cells learned to cooperate, and Slimeworld was replaced by the *Cambrian explosion,* in which life suddenly became *life*, with all of its wondrous complexity.

One line of evidence linking the development of multicellular animals to the Snowball epoch comes from "molecular clock" studies in which biologists estimate the rate at which related animal species diverge.[10] In 2002, Kevin Peterson of Dartmouth College compared proteins from sea worms, sponges, and echinoderms (the animal family that contains sea stars and sea urchins), discovering that they—and apparently all multicellular animals—radiated from a common ancestor that lived about 700 million years ago—nicely in the middle of the Snowball period.[11]

The first fossil evidence for multicellular animals comes from slightly later, during a pre-Cambrian period called the

[8] These arguments are too elaborate to explain at length here. For more information, see Walker's book. The gist is that Hoffman realized that even during the Snowball, the seas would become acidic with dissolved carbon dioxide, some of which would inevitably make its way from the air into the water. This would cause old carbonate sediments on the seabed to partially dissolve back into the sea, flooding the isotope signature of the Snowball with pre-Snowball carbon. Simultaneously, Schrag calculated the manner in which increasing carbon dioxide concentrations in the air would affect the migration of carbon dioxide into the sea, discovering that it would shift the isotope ratio in a way that mimics life-as-usual in the ocean. The result of both calculations is that any new carbonates that form during the Snowball (the fact that some old carbonates are dissolving does not prevent new ones from forming) will have isotope ratios that, on first glance, look like the ocean was full of life. Actually, these same isotope ratios can be created by exactly the inorganic processes that would be going on during the Snowball.

[9] See "Snowball Melting?" C. Marzuola, *Science News*, October 19, 2002, p, 246.

[10] Note that we are talking here of animals. Multicellular plants may have predated the Snowball by several hundred million years.

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Ediacaran.

The Ediacaran has the distinction of being the first geological period newly recognized since the 1880s. The International Union of Geological Sciences formalized the designation in May 2004, after a bitter fight that revolved not around whether the period was distinctive enough to be recognized as a separate subunit, but whether it should be given the name Ediacaran (favored by Australians) or Vendian (favored by Russians). Geology has long been a science in which egos reign paramount.

The Ediacaran began 600 million years ago, and ended at the start of the Cambrian Period, 545 million years ago. This means that it has the distinction of including the final Snowball (which Hoffman believes to have been milder than the first). One of the leading experts on the Ediacaran is Guy Narbonne, from Queen's University in Kingston, Ontario. Narbonne's research focuses on rocks found in southeastern Newfoundland, buried under ash from an ancient volcanic eruption.

To geologists, volcanic ash is one of nature's greatest creations. Normally, fossils are rare and scattered, at best providing isolated snapshots of ancient ecosystems. But ash buries everything at once. Just as archaeologists have been able to learn much about early Rome by digging up the ash-buried ruins of Pompeii, fossil-containing ash beds are treasure troves of ecological information for geologists.

The Newfoundland beds reveal seabed creatures looking like nothing known today.[12] Some were flat fronds. Others were comprised of long stems, anchored to rocks. Still others grew as cabbage-like bushes. The vast majority were constructed of fractal blocks that make them look like they'd been designed by a child, playing with Lego toys.

Narbonne believes that these were bottom-dwelling animals, not plants: filter feeders that held fast to the rock and grazed on passing algae and bacteria. His argument is based on the height distribution. Plants normally compete to rise high in the quest for sunlight. Filter-feeding animals find most of their food near the bottom. Most, therefore, are relatively short—which is exactly the case for Narbonne's Ediacaran community.

Evolutionary biologists have advanced several theories for why the Snowball might have triggered the massive evolutionary leap from single-celled to multicelled life.

The simplest is that it wiped out most prior life, forcing the survivors into isolated pockets, which randomly diverged until the animals in one of them stumbled onto multicellularity. Unfortunately, it's a theory that works best with small, very isolated populations that are capable of rapid genetic change. That means it's more appropriate to an iceball than a slushball, where the isolation may not have been complete.

Another theory is that after the Slushball melted and the hothouse had surged and abated, Earth had a lot of vacant ecological niches into which any organisms that happened to be around could expand and flourish. Briefly, this theory suggests, competition abated and oddball genetic experiments had a chance to take root.

An alternative version of this theory says that the repeated Snowball/hothouse yo-yo was an evolutionary sieve through which multicellular organisms could pass more easily than their predecessors. Such organisms may have

[11] "Dating the Time of Origin of Major Clades: Molecular Clocks and the Fossil Record," Andrew Smith and Kevin Peterson, *Annual Reviews of Earth and Planetary Science*, 2002, pp. 65-89.

[12] *See* "Life After Snowball: The Oldest Complex Ediacaran Fossils, *Geology*, January 2003, pp. 27-30.

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evolved near the start of the Snowball oscillations, as Peterson's molecular clock indicates, but it was the wildly oscillating climate that brought them to the fore when conditions finally stabilized in the mid-Ediacaran.

Yet another theory says that this was facilitated by an upsurge in oxygen following the post-Snowball hothouse. At that time, the oceans would have been a veritable stew of nutrients that would have promoted riotous algal growth. That could simply have returned us to Walker's Slimeworld, but instead, it released a tremendous amount of oxygen into the air, working to the advantage of multicellular organisms.[13]

Multicellular organisms need a lot of oxygen. That can be a disadvantage in some circumstances, but when oxygen is readily available, it works to their advantage because they can use that oxygen to be stronger, faster, and bigger than their single-celled competitors. In a world with lots of oxygen, multi-cellular organisms are like Olympic athletes. Single-celled bacteria and algae still exist—but they're still slime.

Did the Snowball really happen? It's one of those theories, which, from a science-fictional perspective, is so appealing that it's hard to judge it objectively. But it's clear that something strange indeed occurred, and that this something involved a lot of ice.

The Snowball also raises a question that has nothing to do with geology. One of the enduring debates in science fiction involves whether complex life exists on other planets. If the geological weirdness of the Snowball was the cue that jolted life out of its single-celled complacency here on Earth, complex life may be even scarcer than we think. Not only do you need a suitable planet, but you need one which, well after life has taken hold, goes though comparably wild fluctuations—then stabilizes again so that continuing oscillations don't keep killing off whatever interesting life forms might have developed.

The fun in science fiction, of course, is trying to come up with new and innovative ways to do this. Our Earth used the Snowball. Are there other processes that might achieve the same trick? ■

[13]There are geological signs that there was indeed an increase in oxygen during this period.

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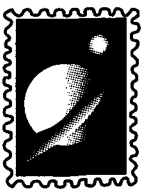

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Report on Ranzipal's Plus-Dimension Carry-All

Mark W. Tiedemann

Bet you wish you had one of these —or do you?

My beeper woke me out of a troubled sleep. "I don't know where it is," I declared, half my mouth blocked by pillow, "I'll look again . . ."

The beeper continued. I groped for it where it lay on the nightstand, fumbled with it for a few seconds before finding the switch, all the while cursing it for intruding on what small peace I had managed to achieve today. The tiny shriek died, but Tracy was awake anyway.

"What now?" she asked groggily.

"Work," I said.

"This is Sunday. I thought you told them you weren't doing Sundays anymore."

"I guess they thought I lied." I sat on the edge of the bed, trying to collect my faculties. I'd been dreaming about her missing ring again, the ring, the cause of all my grief—or so I thought. I felt Tracy roll over and I looked over my shoulder. She had her back to me, the sheet pulled up to her chin. Beneath that sheet was—

I stood and stumbled over to my terminal. It didn't help my attitude to think

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about things beyond my reach. I sighed. Too late, my entire outlook was colored by the fact that my marriage was falling apart.

I moved a box off the desk, pushed aside a pile of papers that needed filing, looked for the keypad. I found the cable and followed it to a book that lay open, face down, on the pad. I glanced at the title—*Traveling Light*, subtitled "The Dynamics of Psychological Baggage in Interpersonal Relationships" by Dr. Judith Holofern, Ph.D.—grunted and tossed it aside.

A moment after keying the office, the screen cleared. Jackie appeared and I smiled. I always smiled when I saw Jackie; she was easy to smile at and she always returned it.

"Sorry, Dave," she said, "but we have an emergency."

"It better be. I was having some of the best sex I've had in a month."

Jackie raised her eyebrows dubiously, but, as always, did not comment.

"Public Safety, this time. We have a situation on the front nine at Chapter Downs."

"The country club?" I whistled. "Should I wear a tux?"

"Just come with all your gray cells."

"I do every time. I'll pick you up in fifteen minutes."

Tracy was sitting up in bed. Her arms were folded across her stomach, just under her breasts. Her mouth was puckered at the brink of anger, but I still thought she was the most beautiful woman in the world. There didn't seem to be anything she could do to make herself undesirable to me. A hopeless situation, since apparently I could do nothing to reciprocate. Not anymore.

"You're going out?" she asked quietly.

"Duty calls."

"What about our Sunday?"

I pulled my pants on and tried not to meet her eyes. I dug in the pile of clothes on the floor for a clean shirt.

"Steve is out of town, Paul's wife is having a baby, and Joan worked the last shortshift weekend."

"What about Brian and Esther?"

"If Jackie's calling me, then they're already on service calls." I found a shirt and shook it out. "It's my turn."

She nodded. "Which puts me on the back burner again."

"Tracy—"

"I really think you need to get your priorities straight, David. I don't like being treated like a weekend 'thing' that's ready and willing when you finally run out of other 'things' to do."

"Tracy, you know—"

"This is the fourth weekend in a row that's been interrupted by something. Last weekend was that dumb seminar you had to attend on this crazy geometry you deal with—"

"Morgentag's theory of residual and corollary dimensions—"

"Whatever! Two days in a motel room and it *rained*, so I couldn't even go swimming! And the weekend before *that* was your mother's birthday, which wouldn't have been so bad except your *nouveau riche* Uncle Dick showed up and kept asking us about our private lives."

"Uncle Dick's a traditional kind of guy—"

"That's just his excuse to be a nosey bigot! I don't care how much money he has, he's still an asshole. And the weekend before *that* was your buddy from Japan who thought eating cold food on your knees was a fun time and who had absorbed just enough Japanese culture to ignore every woman around him until he wanted to get laid!"

"Hey, Dean and I go way back!"

"That's an excuse?"

I buttoned my shirt and found my shoes. I was going to be late. This was leading nowhere.

"What am I supposed to do?" I asked. "Leave my family, tell my friends to kiss off, and change careers?"

"No, just treat me like I mean as much to you as they do!"

I held out my hand toward her, the

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words poised for the dive. A half-gainer with a twist, right into the soup of her sense of relational ethics.

"I have to go," I said instead. "We'll talk later."

"No, we won't. We might do something later, but it won't be with words."

Jacket in hand, I sprinted for the door. My tool kit was right there and I snatched it up on my way out.

"That was a joke," Tracy yelled from the window as I reached my car. "And you didn't even laugh!"

"I love you!" I threw back and ducked inside my car.

It sometimes seemed our most meaningful exchanges took place at twenty paces.

I hurried to the office. Jackie was standing by the service van as I pulled into the parking lot. The bright red and gold logo of Narnya Inc. radiated on the pale blue vehicle.

"Sorry," I said as I got in.

Jackie drove.

"It's okay. I always figure you overestimate your arrival time by five to ten minutes."

I laughed grimly.

"So what's up?" I asked.

"I was going to ask you the same thing."

"I meant about this call."

"Ah. Well, we got a call from the club about an hour ago. There's been an accident and it involves one of our carry-alls. Then I got another call from an EMS tech requesting an immediate service call." She looked at me apologetically. "I tried to get through to Brian and Esther, I really did, but they're both way the hell north in Jamestown and—"

"Don't worry about it," I said. "You saved me from explaining my priapism for the thousandth time. So what went wrong with the carry-all?"

"We have to access it and unload it."

"There? Why doesn't the owner do it?"

"Apparently there's a problem."

"When isn't there?"

"Dave—"

I could hear it in her voice—she wanted to talk about Tracy, about our problems, try to help. Jackie was always trying to be supportive and understanding. We'd gone through school together, trained for the company together, worked together for the past five years. If she were straight, I probably would have married her. Perfection always seems to be just out of reach.

But the fact was, Tracy was a problem solvable only by the impossible. I had lost her mother's ring, an heirloom she had kept beyond hope when her parents had died and she learned that her brother had managed to spend, steal, or otherwise appropriate everything else. That ring—a small, silver band with intricate *art nouveau* designs framing a single star sapphire—had been the only physical memory of her childhood and it meant—

Well, it meant enough that she had continued to blame me for its loss since it disappeared over two years ago. To say "I lost it" is imprecise. I didn't. But I'm not the neatest person in the world. Clutter follows me from place to place, like a state of mind or a family curse, and I am impossibly disorderly. Tracy had tried to isolate the clutter in the house—more so since the ring disappeared—and had managed a limited success. I'd tried to get a handle on it, but—

The thing was, that ring should have been nowhere near where my clutter could have been responsible. But.

Oh, we'd searched the house. And the car. Even my office. Repeatedly. Tracy was devastated. She tried not to blame me, but the longer she went without that ring and the more my job kept interfering with our lives, well . . .

I sighed with a finality that suggested now was not a good time for Jackie to be intrusively understanding. She kept silent the rest of the way to the country club.

We were escorted through the club-

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house by the vice president himself and out onto the green. A small cluster of various officials were gathered together on the fourth hole. In their midst lay a dead man.

I did a double-take. Correction: a very overweight dead man, wearing one of our carry-alls on his belt. His golf clubs were a few meters away. A huddle of nervous caddies talked among themselves outside the circle of club members and public safety personnel. The corpse looked kind of familiar . . .

"I'm Lew Crannameyer," someone said. I turned and found my hand being shaken by a short, robust fellow in a tweed jacket. "I'm the public safety deputy for this county."

"David Gath," I said. "We're from Narnya."

I always expect a different response than I actually get when I say that. I have yet to be disappointed in my more cynical attitude about the literacy of our clientele. Lew Crannameyer had as much and no more perception as is usually commanded by a public official.

"Bad situation here," he said, pointing at the corpse.

"What happened?"

"Uh, well . . . Harry?" he called to someone. A tall, bearded fellow dressed for golf looked up from a conversation with two other sportsmen and came over. "This is Dr. Stallings," Crannameyer introduced. "He was playing with Mr. Shafer. He can describe what happened."

"Shafer. . . ?" I asked, trying to look at the corpse and shake someone's hand at the same time.

Dr. Stallings grasped my hand with dignity, then looked at the body. "This was our second round today," he said slowly. "I suggested earlier that we not play the full course, but Dick was adamant. He was quite fatigued and showing signs of physical distress on the last hole. I got him to agree to quit after one more hole. He'd been losing all morning, you see, and he hates to lose, so I was giving him a chance to draw even. I intended to let him take this hole—that would have evened up the match and we could quit. He, uh . . . keeled over where you see him."

"How long ago was that?" I asked, walking around to the dead man's head.

"Two hours."

I blinked. "Why is he still here?"

"We can't move him."

"Excuse me?"

"He's too heavy. We can't pick him up."

I looked at the face. "Son-of-a . . . Uncle Dick."

Dr. Stallings frowned. "You know him?"

"He's my uncle. Was. I don't understand. He weighs maybe two-thirty, two-fifty tops. How come—"

"It's his carry-all," Crannameyer said. "It seems to have malfunctioned. All the weight is on that side of his body."

"Oh."

"That might be what killed him," Dr. Stallings said.

I looked at him closely. Was this an implied lawsuit? "Are you a physician?"

"No, I'm a chemist."

"Is there a physician present?" Jackie asked.

"Uh, sure," Crannameyer said. "Let me introduce you."

He took Jackie off.

"Uncle Dick," I repeated. I wasn't sure what my reactions meant. It was almost comical, seeing him like this; dead on a golf course he could not have afforded to join ten years ago. Uncle Dick had always dabbled in stocks, usually losing money, but he never threw anything away. Like me, I guess. His house—the new one, the one he'd moved into a few years ago, much larger than the bungalow he had lived in since I was a kid—was constantly filled with clutter.

One of the stocks he had never gotten rid of paid off. Uncle Dick was a millionaire. Had been, anyway.

And it hadn't changed him one bit.

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Tracy's assessment was correct—small minded, devious, a bit of a bigot, and then, with the advent of untold wealth, a graceless social climber.

"I didn't even know he owned a carry-all," I said.

"Yes," Dr. Stallings said. "He wore that damn carry-all constantly."

"You don't like our carry-alls?"

Dr. Stallings gestured at his friend, my uncle, and raised his eyebrows meaningfully. I had to concede his point.

The carry-all wasn't supposed to malfunction. There were failsafes, of course, but I suppose anything can break. They don't usually kill people though. Dr. Bedeg Ranzipal had developed the principle and managed to apply it commercially for a simple replacement to the wallet, the handbag, the suitcase—anything that might require one hand or both that we might otherwise want free. Rigorously tested, Narnya Inc. had the rights to exclusive marketing of the carry-all. Which also made us exclusively responsible for any snafus.

Basically, it's a simple enough concept. Picture a bubble attached to space-time, sort of like an appendix. Within the bubble is a sort of non-space, a place where physical objects alone define dimension. Now, since this bubble is only attached to space-time and not really a part of it, there's no interaction—gravity, radiation, momentum, inertia, that sort of stuff has no connection across the transom. The transom, however, the point of access, *is* connected, but not in the normal sense of material objects being connected to space-time. The result is a very handy conditional sphere of existence where you can store things and carry them around with you without actually having to carry them. The objects go into the bubble and stay there. The bubble doesn't move, only the transom, which is generated in the small device that is attached to one's belt.

So far, the only malfunctions we'd had to deal with were inaccessible transoms, where people can't recover what they've placed in the bubble. Our success rate of recovery has been 98 percent. One time we lost a Stradivarius. Who knows where that violin went? We settled out of court.

This didn't look like that sort of malfunction.

Jackie came up to me looking grim. "The doctor says it was definitely a cardiac arrest. Massive."

"Dick hadn't been well," Dr. Stallings observed.

"Would you happen to know what he normally stored in his carry-all?" I asked.

"I don't know. That's rather like going through someone's dresser, don't you think?"

I walked up to the corpse. His silk shirt had been opened down to his navel. If anything, Uncle Dick looked as if he had just been told something bad about his tax return. The carry-all was not visible.

"Where is it?" I asked Jackie as she joined me.

"Beneath him," she said. "He wore it on the back of his belt. Stallings said it got in the way of his form if he wore it on the side."

I rubbed my face. "And we can't roll him over?"

"It's clipped to his pants, too. We'd have to undress him."

"Aw, shit."

"Why don't we just open the transom with the master code and see what comes out?"

I looked at her. She didn't look any more excited about that than I felt, but I couldn't think of anything else.

"All right," I announced. "Everyone please step back. We're going to open his transom. Please stand well away, we don't know what he might have in there."

I felt stupid saying it, but I tried to put authority in my voice.

"What about the green?" the vice

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president demanded.

"What about it? You're insured, right?"

"But—" He looked at Uncle Dick's body, then at me, and shrugged. "Very well."

Jackie had opened her kit and pulled out the small master override. It looked like an old-fashioned portable tape recorder. When everyone was back a satisfactory (I hoped) distance, she activated it.

The body sort of rippled in place. Alongside it another full set of golf clubs appeared.

"Hm. That's all?"

"No," she said, frowning at her override. She pressed the contact again.

A suitcase appeared alongside the clubs.

"Packed," I said wryly. "I'll wager for a vacation he never got to take."

Jackie scowled at me. I shrugged. She pressed.

Another suitcase and a briefcase.

Then a large safety deposit box. I wondered how he'd managed to slip that by the bank. In the carry-all, sure, but you'd think they'd miss it.

"Any more?" I asked.

Jackie nodded.

"Did he keep his life in there?" Crannameyer asked.

"Some people keep their lives in the damnedest places," Jackie said.

I winced.

A file cabinet materialized. All this while Uncle Dick's body had been bubbling and shifting around. The transom was stretching to accommodate the passage of each item as we extracted it.

A spare tire. The jack and tire iron. Half a dozen books.

"We ought to be able to move him now, don't you think?" Crannameyer said.

I shrugged and looked at Jackie.

"My readout," she said, tapping the override, "says there's more in there. But you can try. I can't get a mass reading with this."

Crannameyer nodded grimly and gestured to some EMS techs. Four of them hurried through the spreading array of objects on the green and grabbed legs and arms. They heaved. Uncle Dick came about three inches off the ground. I heard joints crack loudly and they set him back down.

"What the hell else?" Crannameyer hissed. His face was turning red.

The vice president of the club had been joined by the president, it looked like, and they both regarded the clutter with pinched, concerned expressions.

"Again," I said to Jackie.

She pushed her button.

Plastic wrapped suits, all fresh from the cleaner, popped out across the ground. Six of them. But they looked much too small for Uncle Dick. I checked the tags—thirty-six mediums. What?

A camera case. A lunch box. A cooler chest. Fishing tackle.

"He never told me he fished," Dr. Stallings said morosely.

A baby grand piano.

"Aw, for—" I started. "No wonder the damn thing malfunctioned!"

"He didn't tell me he played piano, either," Stallings said.

"He doesn't," I said. Then I thought about it. "No, he doesn't. I never knew he played golf, either . . ."

"Can we move him yet?" Crannameyer demanded.

"Try it! I don't know. Maybe he's got a spare car in there, too."

Crannameyer looked at me with eloquent resentment, but nodded to his people. This time the body came away easily.

As they carried him past, I stopped them and reached under to unclip his carry-all.

"Standard model, designed for maybe onehundredfifty kilograms, max."

Crannameyer looked at me, then at the debris on the green. "My god, it looks more like fifteen hundred kilograms."

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"More. I'd say he exceeded the design parameters of the device by a factor of at least ten. I don't think Narnya's liable."

"What about all this—this—" the vice president of the club gestured at the array. "Stuff."

I thought about that for a moment. "Tell me, have your members complained of thefts in the last year or two? I mean, how long has Uncle—I mean, Mr. Shafer—been a member?"

"Six months." Crannameyer frowned. "You don't think. . . ?"

"I'd call your insurance company ASAP," I suggested.

He considered that for a few silent moments, then nodded and walked off.

I hefted the carry-all.

"There's still more in there," Jackie said. "Not much."

We went back to the van and Jackie opened the transom again. A couple of wallets, an antique mantle clock, and a small silver object fell out on the seat.

I picked up the last item.

Tracy's ring.

"So what exactly happened to the carry-all?" Jackie asked.

I shrugged. "I'd guess that it couldn't maintain a large enough bubble separate from this continuum, so it started load sharing."

"So your uncle ended up carrying all his freight around the green?"

I smiled. "Sort of a metaphor for life, don't you think?"

Crannameyer came out of the club and came toward me, followed by the vice president, both faces grim. I slipped the ring into my pocket.

"I want a report on this phenomenon by tomorrow," Crannameyer said. "The press is going to chew my butt and I want some answers."

"Tomorrow—"

Jackie cut in. "I can make out the report."

"I don't care who makes it. I want it."

"I want all this stuff removed from the green!" the vice president said to the public safety man.

"Yes, sir," Crannameyer said. "I'll get a truck out here and crew—"

"A truck? On my green? It's bad enough that an ambulance and all these people are stomping around out there—"

"Please, sir, I have—"

"Don't patronize me!"

They walked away.

"Sort of a metaphor for life?" Jackie asked.

I looked at her. "Yeah, I guess it is. I mean—"

"I know what you mean. Do you know what you mean?"

"Sure. Don't let the shit pile up till it kills you."

I left Jackie at the office and went home. I kept the ring in my hand all the way to the bedroom. I didn't know if she would exactly believe me about Uncle Dick, but it didn't matter. The ring was a massive weight removed from my shoulders.

After that, it was time to unload my own carry-all. Maybe we could start traveling light. ■

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Written in Plaster

Rajnar Vajra

Some tangled webs are very far-reaching. . . .

By the year 1937, at that tender age when most Second Form students are aware of little but themselves and each other, Danny's attention was largely directed downwards.

He'd first adopted a slumped posture back in Junior Four, when he was only eleven. Being smallish and newly transplanted from London, he'd been a target for bullies and soon learned that his best hope for averting bruises was avoiding eye contact. But the trick failed whenever it seemed intentional, so Danny spent progressively more time watching the floor.

The slump didn't congeal into habit until one cold morning a year later.

Roaming the Nemeton, the narrow local forest, he'd noticed an emerald flash among the detritus at the foot of Barcombe's Hill. He'd brushed aside enough dirt to uncover a thumb-sized chunk of pure jade, green nephrite smooth as glass and clear enough to make a lapidary salivate. From then on he virtually ignored the view above knee-level and hunched along outdoors as if someone had left a trail of shillings.

On Danny's thirteenth birthday, his mother warned him he could wind up as irredeemably stooped as his grandmother. The idea frightened him. The dear woman was bent so severely she couldn't get into a chair without rolling into it.

So within Lesser Horstead, his village, or inside the ivied walls of Dun Hugadarn where he attended school, Danny began a conscious effort to stand tall . . . whenever he remembered and was sure no bully was nearby. A trivial sacrifice, really. After all, the most precious item he was likely to find in these tamed places would be a misplaced hairgrip and any such treasure would only have to be returned. But he couldn't resist keeping at least a cursory surveillance downwards, which inevitably tugged his head lower until he caught himself and straightened up again.

On hikes between home and school

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he allowed his obsession full scope. You never knew, he thought while scrutinizing every molecule of forest floor, when you might stumble upon a diamond or ruby or some gem still unnamed because no specimen had ever been found!

His eyes, sharpened for mineral spotting, automatically noted anything unusual underfoot, which on any given day might range from curiously shaped vole droppings to lethal-looking cerise toadstools. So it wasn't surprising that on his way to school the second Tuesday in March, Danny saw the dozen small plaster chips lying close together on the footpath. The surprise was the chips themselves.

Most local homes and even Danny's school were sheathed in plaster toughened by horsehair and seldom enlivened with any color beyond a drab brown. *These* fragments, however, were an intense blue-violet quite unlike any native material.

Danny lifted one and tried to crumble it between his fingers. He yelped, opened his hand, and stared at the red droplet on his thumb. He bent down and prodded the fallen chip with a twig. No matter how he turned it, he couldn't see anything spiky. "Must have a cruel edge," he thought.

Fascinating as this was, time was passing and he didn't dare be late for class again. He stuck a branch in the ground to mark the spot and hurried on.

The riddle of the chips was immensely more interesting than anything his teacher had to offer that day and he couldn't wait to investigate the matter further after school.

But when he located the branch on his way home, every fragment was gone. This only escalated the mystery and he thought of nothing else until he fell asleep that night. He even dreamed about violet plaster.

Next day, he was disappointed to find no new chips lying in ambush. And he had the same absence of experience for a fortnight after that. He started rehearsing excuses for visiting the forest during the upcoming Easter break because his mother and grandmother invariably saved up enough chores during school vacations to keep three teenagers busy.

On the Tuesday night before Good Friday, while Danny, his mother, and grandmother were huddled near the big wooden console to hear the latest installment of *The Shadow* starring the admirable Orson Welles, a heavy rainstorm soaked all of Sussex County. The BBC rebroadcast was fuzzy with static and the older woman, folded into the overstuffed chair that had been Danny's father's favorite, asked the boy to repeat whatever had just been said so often no one could follow the plot.

He didn't care. His mind was clouded with plaster chips.

By morning, the rain had eased to misty drizzle and the forest floor, generally so absorbent, was a thin quilt of pools, streamlets, and soggy leaves. Danny had to step shrewdly to keep his feet dry and to avoid a temporary blanket of earthworms.

His stick was barely upright and as Danny replanted it more firmly he spotted a peculiar impression in the damp soil nearby. To one side of the impression, in plain view, lay a violet-hued plaster fragment.

Forgetting about his minor injury during the previous such encounter, Danny pounced on the evidence, studied the rectangular shard from all sides, and stuck it into his only buttonable pocket for closer scrutiny later. Then he examined the indentation.

Not a paw-print, he decided, and *certainly* not a footprint, because it was too big, deep, and triangular. He stomped, but even after a night of deluge, his shoe barely dented the ground.

When he noticed a similar impression four strides ahead, somewhat shallower because the ground was even firmer here, he had to reconsider. If some *animal* left this track, he thought as his imagination warmed up, it's fearfully

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massive. . . .

He was glad to pass the tall boulder marking the Nemeton's southern terminus and gladder still, a short trot later, to enter through the gateless ancient wall surrounding most of Dun Hugadarn. This was the town's back entrance, only used by villagers and those few townspeople who regarded the forest or the village beyond as places worth visiting.

The wall, he'd been taught, had originally been oaken, built by the Celtic king Cogidnubus who'd been emulating the Roman forts he so admired. "Dun" had been derived from the Celtic "dunum" meaning a fortified place, while Hugadarn was a regional demiurge. But no one could say if the idea behind combining the words had been to enlist the god or keep him out.

For the first time ever, Danny wished the townspeople hadn't torn down the old king's gates. And he dreaded the long walk home.

He was distracted in class and his teacher, Mrs. Wetzel, like a successful predator, sensed weakness. She always wore her dust-colored hair squeezed so tightly in a bun it was a wonder she could frown, but Danny didn't appreciate the miracle whenever she asked him to express "in his own manner" what she'd just said. Each time he could only stammer, blush, and promise himself it wouldn't happen again. But after a minute, his thoughts always returned to the forest. The other students found his discomfiture increasingly funny.

To compound his woes, Osric Paynter, the worst bully in Sussex, chose today to approach Danny during lunch break and no amount of avoiding eye contact deflected his attention. Ozzy was two years older and a head taller than any other student in Second Form.

"I learned all about ye, Danny Levan," he sneered too softly for anyone else to overhear. "Ye be a Jew, isn't it so?"

Danny's vision seemed to darken. "I—" he didn't want to just come out and admit it. "Why are you whispering?"

Ozzy's smirk was an ugly thing. "I won't *stay* so quiet about this if ye don't do what things I tell ye. First thing: admit yer guilt."

Danny kept a careful watch on Ozzy's hands; the bully relished the sudden blow to the solar plexus. The black hair on his pale forearms wasn't dense but had a spiky thickness more suitable, Danny thought, for the legs of a giant horsefly.

"I'm half Jewish," Danny said, wondering how the family secret had gotten unleashed.

"Part rotten is all rotten, laddie. Your kind killed ourn Savior and ever'n knows ye drink the blood o' Christian infants on yer pagan holidays."

The unfairness of these accusations burned, but Danny simply turned away. He was wise enough to understand that words can't open a closed mind; besides, argument would only give his accuser permission to start hitting. Ozzy's anger was always primed to overflow and anti-Semitism merely provided the latest convenient channel.

Osric, outraged at being ignored, spun Danny around and grabbed his shirt, intending to keep the smaller boy within striking range. Instead he yelped and let go, glowering at a swelling red droplet on one finger.

"Damn ye!" he hissed. "Did yer mum leave a *pin* behind when she diapered ye this morn?"

Danny stared at the oozing finger in shock. Possibly a thorn had worked its way into his clothing, but more likely the cause of the injury rested in his pocket. Strange, the bully had just mentioned Christian blood. . . .

"Honestly, I'd no idea—"

"Don't ye fret, laddie. Yer about to repay this liddle prick and more."

Just then, Mrs. Wetzel emerged from her lair and, as a predator should, immediately noticed the blood. She hauled her wounded prey off to the school's tiny infirmary before he could do more than promise violence with his eyes.

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Danny was upset on several levels. His mother had made his Russian-born father, David, convert to the Church of England before she would agree to marry him, so Danny knew little about Judaism or its customs. David Levan had declared the common myths about the "Chosen People" utter nonsense, but Danny couldn't vouch for this from direct experience. Occasionally when his wife was absent, his father *had* spoken to him about Yom Kippur, Rosh Hashanah, and other arcana. And he'd confided that Danny had some highly artistic relatives whom his mother would prefer forgotten, including a cousin in the States acting in and writing music for Hollywood movies!

He'd also shared bizarre tales involving a secret kind of Jewish magic or perhaps science, which would have been fun to hear except for the context: growing up in St. Petersburg where prudent Jews practiced their religion covertly.

If only his father were still alive! How hard it was to be certain of anything. And he was keenly aware that Ozzy intended to look him up later.

Danny had to wait in line to use a small lavatory where the ventilation was no match for the need. The smell inside always made him feel ill, but he wanted the privacy of a stall to take off his shirt and search for anything sharp.

He couldn't find even a twig hiding in the lining of his garment, but he found two puzzles. One was a tiny swelling on his bare chest as if from an insect bite. It itched a bit but he wouldn't have given this a second thought if it weren't for its location: exactly behind the chip-bearing pocket. And the other puzzle concerned the chip itself, which was half the size it had been when he'd found it.

He inverted the pocket, but discovered no fragments. Where, he wondered, did the rest go? He stared at the chip for a minute, but learned nothing.

I must show it to Professor Smith after I get home, he thought, returning the fragment to the pocket and putting his shirt on. She'll be able to ferret out an explanation!

During the dregs of school, Danny shaped a strategy to avoid possible monsters and a certain beating. The instant class ended, he'd take off sprinting and wouldn't stop until he'd closed his front door behind him. Surely whatever was heavy enough to leave such tracks wouldn't be *fast*!

This sensible plan foundered when his teacher insisted he stay after class.

"Mr. Paynter informed me," she said, "that you stabbed him with a hatpin."

"That's not true, Mrs. Wetzel!"

She raised an eyebrow plucked to a mere line. "I saw the wound myself, Mr. Levan. I suggest you settle in your chair and consider the virtues of honesty for the next hour while I grade some papers. You will not fidget or tap and will remain quiet until granted permission to speak.

"But, Mrs. Wetzel—"

"Continue your complaint if you wish an encore performance tomorrow."

Danny shook his head silently.

"That's better. Now go sit."

The classroom had two small windows and Danny was alarmed to see clouds thickening outside, bringing on a premature dusk. He'd often strolled through the Nemeton in the evening, but he'd never been afraid of the place before.

When his teacher finally released him, which somehow coincided with the instant she finished her paperwork, he hurried outside and broke into a run. The forest—oak and yew with the odd rowan and wild cherry—had a forbidding aspect in the faux twilight, enhanced by a ground-hugging fog. The deciduous trees were mostly, in Sussex vernacular, "undraped," but new leaf buds were beading most branches, suggesting a horde of motionless spiders.

Danny desperately wanted to keep running, but since he could barely see where to put his feet, he was forced to slow to a walk even as he stepped past

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the Sentinel, the tall boulder beyond which the Nemeton officially began. The bass drum of his heart shuddered in his ears.

For once he was more concerned with the view ahead than the one below and his eyes ached from straining to pierce the gloom. Twenty paces into the forest, he heard a hissing sound from behind. He whirled and caught one horrified glimpse of a dark lump apparently squeezing its way out of a crack at the Sentinel's base. This lump was swelling quickly, reminding Danny of the blood welling up from Osric's wound.

He turned and dashed off, terror erasing caution. He fell four times before he left the forest and emerged with skinned knees and a nasty forehead bruise.

Safe at home, surrounded by family, Danny felt ashamed. In retrospect, the headlong flight seemed beneath the dignity of a thirteen-year-old. It wasn't as if anything had been *chasing* him. As far as he knew, no one had come to grief in the Nemeton since those days when Picts came raiding from the far north. Surely, what had scared him so had been the product of an overly active fancy, stimulated by tracks that had to have a logical explanation.

He explained his injuries by telling his mother he'd stumbled over a fallen branch, which was a quarter truth. His mother fussed over him, applying hot soapy water, then iodine, and finally damp bandages because "wet dressin' to wet wounds" was common wisdom. Concern deepened the lines in her thin face. When the iodine stinging eased, he began to feel sleepy until he remembered the plaster chip in his pocket and his intention to pick Professor Smith's brain about it.

Meghan Smith had a brain worth picking! In her case "Professor" was a courtesy title, because while she'd regularly lectured at Cambridge, no female had yet been granted a professorship there. She and her husband, Ned, had been celebrated archeologists, traveling the world whenever their respective colleges weren't in session until his death from a hippopotamus bite in 1929. That year she retired from teaching and fieldwork, eventually settling in Lesser Horstead where she spent her days organizing three decades of research. As far as Danny was concerned, Smith knew everything about anything and the fact that each had lost the most important man in their lives was a bond between them.

Danny's grandmother had baked a herd of gingerbread horses and he asked her permission to bring the professor a basketful.

"'Tis a sweet thought, Dan," she wheezed. "Tha' woman must get lonely of an evenin'. And seein' as how ye've been through der hoop this night, I suppose we can excuse ye yer chores."

Danny's mother had been listening in. "And your schoolwork?"

"All caught up, Mum."

The two women exchanged smiles. "Say hello to Meghan for us, dear," his mother said. "And don't you be gone overlong. And don't gobble down her cookies before she gets to at least see them!"

Professor Smith's 'home always smelled of cat and chamomile. It was both fussy and intriguing with exotic bric-a-brac, but clean and neat except for the corner where field journals and sketch pads reached almost to the rough ceiling planks.

The woman herself was tall and always reminded Danny of a birdcage; her skeleton was wide but the bones seemed thin as wires. Although she was nearly a septuagenarian, her hair still had auburn deposits among the gray and her blue eyes were big, bright, and gentle behind round spectacles.

"Young Daniel," she said upon opening the door to his knock. "How nice to see you. What have you done to your forehead?"

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"Just a little bump, Ma'am. I've brought you a present."

Smith accepted the basket, sniffed appreciatively at the contents, and stepped back so Danny could enter. While he closed the door, she removed the insulating towel and smiled down at the little tan ponies.

"They're still warm! Thank you. And do thank Molly for me—or was it Anne did the baking?"

"Grandmum. Mum hasn't baked since. . . ."

"I understand. These would go a treat with tea, don't you think? Might I prevail on you to join me for a small dessert?"

"Well, of course, but I really just used the cookies as an excuse to see you."

"Oh? You've found another Genuine Norman Spoon then, or a new jade sample?" The words were mocking, but her obvious affection for him removed any sting.

"Not this time." He fetched out the mystery fragment. She stared at it briefly then put down the basket and switched to reading spectacles before she reached to take the chip from his hand.

"Take care, Professor! It may have a hidden barb."

She studied it closely for a moment then lifted it delicately. "I see no barb. Where'd you get this, lad?"

"In the forest. It's plaster, isn't it?"

"It appears so." She closed her eyes briefly. "Aye. I've seen violet plaster once before but in a darker tint."

Danny felt a surge of excitement. "Have you now?"

"At the New Grange tomb-shrines. Druid work, don't you know. One of the caves had a spot of such plaster on one wall. I wonder if it's still there."

"Why would plaster be violet?"

She smiled. "My Ned guessed the Druids had mixed tincture of woad, *Isatis tinctoria*, in with the local clay. Only the good Lord knows why. Let's peek at this through the Crouch, shall we? It's rather too thick to fit properly, so would you howl if I removed a small sample?"

Danny had no idea what she was asking, but agreed with her plan on general principles.

The "Crouch" turned out to be the somewhat antique but beautiful brass microscope inhabiting a shelf in Smith's bookcase. She abraded one corner of the chip with a small corundum file and dabbed some resulting dust on a glass slide. She placed the slide into the microscope, explained how to adjust the focus, and let Danny have the first turn peek.

"Very odd," he remarked, moving aside so the archeologist could look.

As she peered through the ocular, her voice took on the singsong quality of someone splitting their attention. "Under even modest magnification, Daniel, the most ordinary things appear extraordinary. Ah! But this *is* extraordinary!"

The grains of dust were all rectangular, like miniatures of the chip, and each was covered with threads so minuscule they were barely visible through the Crouch. The threads were similar to *setae*, those tiny hairs on a gecko's foot that allow such lizards to cling to virtually any surface. . . .

"Your find is certainly not plaster, my lad. But I can't say what it is."

Danny was chewing his lower lip, trying to decide how much to say. "Could—could something like this change shape by itself?" he finally asked.

Her eyebrows lifted slightly. "*Has* it changed shape?"

"It's shrunk a good much since this morning."

"How very peculiar! Would you allow me to send it off to a scientist friend of mine in London?"

The idea struck Danny as perfectly sensible and he didn't understand his intense reluctance.

"That would be fine with me," he lied. "But might I hold on to it for a few days longer?"

"My dear boy, this is *your* discovery. We shall send it off, but only when you

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are quite ready. Please just take care not to lose it."

Danny felt a sense of relief as inexplicable as his newfound attachment to the chip.

The gingerbread proved delicious and, in Danny's opinion, made up for Smith's herbal tea. He left the cozy house feeling better than when he'd entered.

But on the short walk to his cottage, he worried that someone, hidden behind a wall or tree, was watching him. Would Osric Paynter have come all the way to Lesser Horstead to get revenge?

When he got home, his mother looked up in surprise at how abruptly he opened the door and how heavily he slammed it closed. He answered her scowl by stamping his feet, hugging himself, and shivering. "Getting cold out there," he claimed. "Didn't want to let the chill in." Then he rushed up two flights of stairs to his room to avoid being questioned.

The ploy wasn't successful. As he eased under the bed-covers and reached to extinguish his night lamp, his mother entered the room and perched on his mattress.

"Might something be troubling you, Daniel?" she asked stiffly.

He had a sudden urge to tell her about Paynter and his other problems. But as he gazed at her tired hazel eyes, creased cheeks, and stern mouth, he had an extraordinary thought: perhaps her soured countenance wasn't a sign of disapproval, as he'd always assumed, but of sorrow. She, too, had lost someone she'd loved. . . .

"I'm just sleepy, Mum," he said.

In the depths of night he was awakened by peculiar noises. Amid the hiss and rattle of loose thatching in a brisk wind were a series of deep thumps and the chatter of hail pattering on the street below. With winter gathering its powers, such a serenade would've been unremarkable except that he couldn't hear a single hailstone strike the roof. And the hailing was accompanied by brittle pings and clinks reminiscent of one afternoon when he'd thrown a broken China vase into the fireplace to see if it would burn. He waited a moment, but now only heard the winds and a distant owl. He forced himself from his warm bed, threw open the window sash and leaned out over the narrow street below.

The nearly full moon was high, providing ample light to see the immense creature beneath him. It was manlike, as a bear standing upright is manlike, but far larger than any bear Danny had seen at the London Zoo. Its massive triangular feet were splayed out on the cobblestones yet its head reached to the second story, within a yard of Danny's eyes. Plated with moonlight, the naked giant's glossy skin still hinted of violet; a loamlike musk made the air pungent despite the wind. A twig nestled between a pair of short horns chining the flat skull.

Danny felt numb; his mind was blank and he couldn't move. With a crunching snap, the giant head tilted backwards. Hard fragments showered from a fresh crack in the massive neck, and Danny stared as those fragments hit the ground, grew spidery legs, and scuttled to the nearest immense foot where they quickly melded with the dark surface. But then the boy saw the monster's face and the three exotic symbols chiseled deep into the broad forehead. In that instant, fear transmuted to wonderment. He thought he understood.

The creature had eyes of a sort: round clayish balls in deep sockets, and a long aquiline nose without nostrils. The mouth was a straight gash, lipless and unmoving. The eyes, however, rolled slightly in their sockets and tiny chips occasionally fell from the edges like dry tears.

That face seemed too immobile to express emotion and the creature was apparently incapable of even the faintest moan, but Danny was touched by a sense of misery mixed with urgency. The creature lifted an arm and as its clay

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eyes bulged slightly, Danny winced in sympathy at the new cracks in its shoulder and chest, which quickly began filling in with thousands of small wedges.

There could be, he told himself, only one reason for this visitation. So he hurried to where his shirt was draped over a chair. The flannel was flapping as if it imprisoned a frantic mouse. The instant he managed to unbutton the pocket, the formerly quiescent fragment leaped into his hand. He gazed at it for a moment, hoping that Professor Smith would forgive him for disregarding her wishes, then rushed back to the window. As the fragment fell, it stretched itself into a single wing and spiraled down to land on the creature's nose. An instant later, it melted into the plaster-like skin and Danny absorbed a new feeling: not relief exactly, but the satisfaction of a necessity fulfilled.

Still, the monster wanted something more.

Its arm made a wide invitational gesture, opening new wounds, and the giant turned and lumbered south keeping its legs straight and its body as rigid as possible. At every slow stride, cracks opened in the lower torso with a rain of plaster while distance increasingly muted the snapping and crunching.

Danny spared one glance at John and Dorothy Burry's cottage across the street; not one light had come on. He'd often thought his family and neighbors could sleep through anything. Here was proof!

A pack of chips was constantly pursuing and reuniting with the giant, but moonlight glinted off of one largish piece that seemed in danger of being left behind, lodged in a groove between cobblestones.

"Wait," Danny called out softly and although the creature was obviously too far off to hear, and lacked ears besides, it immediately paused long enough for the chip to free itself and join its fellows.

The boy was invaded by emotions he couldn't quite name. Without thinking, he threw on some clothes, silently made his way down to the front door, stepped barefoot into cold boots, and followed the retreating form.

The forest was all moonlight and shadow and filled with a hazy peace. Here, all wind was stilled. If the giant was aware of Danny, it didn't show it but kept plodding forward until it reached the Sentinel. Slowly, it lowered itself to the ground near the boulder. It hesitated as if gathering courage, curled one fingerless hand into a fist, then raised the fist high and brought it crashing down on one of its own feet.

The foot broke into a thousand fragments and part of its hand fell off. Before the fragments could rejoin the body, the arm came down again and again until both legs were shattered and the fist was a stump. Some limit had then apparently been reached because the whole body suddenly fell apart, sounding as if an entire glass factory had come tumbling off Barcombe's Hill.

This apparent act of ultimate self-loathing was too much for the boy. For the second time this night, he ran away. If this was the magic his father had told him about, Danny wanted no part of it!

But instead of sensibly returning home, the urgency of his feelings sent him to a different cottage. He hammered on the door and after a moment, light seeped through the curtains. He heard the shuffle of elderly feet in elderly slippers. The door opened.

"Young Daniel!" Professor Smith said. "Come inside straight away; you look all peaked up and half frozen. What crisis draws you out at this hour? Is your family ill?"

He barely remembered to remove his boots before stepping onto the carpet in her small sitting room. Two cats glanced up from the fireplace hearth then resumed drowsing near the blushing embers.

"I'm sure Mum and Grands are snug as your moggies, Ma'am." To his shame, his voice was quivering.

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She studied him with concern. "Ah. It eases me to hear that much. Do sit down, dear. I gather you haven't come on a social visit?"

Danny shuddered, perched himself on the sofa, wrapped his arms around his stomach, and plunged into a fairly thorough recounting of events beginning from finding the first set of chips. She stopped him once, just long enough to fill her teakettle and set it on the stove. Then she resumed sitting opposite him, watching his face as he talked, and didn't say another word until he was finished.

At that point he rubbed his legs, which had gone all pins and needles, and asked, "You do believe me?"

She reached over to pat his hand. "Haven't I been around the world and seen a thing or two? But I must confess, I might've wondered if you'd had a singularly vivid dream if I hadn't had my own strange experience."

His eyes widened. "What happened?"

"After you left, I peeked through the Crouch for another look at our sample. The particles had clumped together and as I watched, the clump grew limbs and marched straight off the slide! I lost track of the tiny thing after it fell to the carpet. So I quite believe you, but I'm quite empty of explanations."

"I have one." His earlier sense of wonder was returning.

"In that case, I am all attention."

"Well, I didn't describe the giant completely. Its forehead was marked with three symbols. Three!" He hesitated for a moment. "How well did you know my father?"

The non sequitur didn't seem to faze her. "I treasured our friendship. David was as warm and sincere a man as ever I've met. And so very inventive."

"Did you know he was . . . Jewish?"

Her eyebrows rose. "Certainly. Ah! Perhaps I see what you envision, but do go on."

"Father once spoke of some Jewish magicians: The Masters Of God's Name, if I'm remembering aright."

"Daniel, I think you must mean Masters Of The Good Name. Such is the proper translation of Ba'alei Shem Tov, although your version may better echo their intent."

He shook his head admiringly. "You know so much! I daresay you already know the story of how these Masters studied God's creation of Adam and learned enough to make a clay soldier designed to protect Jews?" He frowned, trying to recall particulars. "My father called it a—a goblin or some such."

"Golem. In some folktales, three Hebrew letters—aleph, mem, and tav spelling *emet*—inscribed on mud that's been roughly shaped into human semblance would bring the mud figure to life. To, ah, decommission the golem, the magician would erase the aleph, thus turning *emet*, which means 'truth,' to *met*: Hebrew for 'death.' "

"That's exactly what Father said! I rather liked the idea at first, but then earthen titans spoiled my dreams for years!"

She regarded him seriously. "So your idea is that some Jewish sorcerer spelled up a golem that happened to blunder into Sussex?"

"Not just *any* magician, Ma'am." He felt his face flush.

She stared at him for a moment then briefly turned away to wipe something from her eyes. They glistened when she met his gaze again. "You believe your father was one of the Ba'alei?" she asked gently.

"Yes! He said the Masters were a *secret* society! You're a scholar and you know everything, but why else would *Father* know about them? Mum made him renounce his past, but I think when he found he was dying, he made a giant that can't help but protect Jews. And when it comes to it, I'm the only person of Jewish blood around here."

"Why on Earth would you need protecting?"

"*Because* I'm Jewish. That wouldn't make me liked if word got out."

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She frowned. "I would hate to think such ill of my neighbors."

"And it's so unfair! I didn't choose to be this way!"

"Ah. I wasn't lucky enough to know David for long, lad, yet we were close enough for me to assure you he wasn't ashamed of his heritage. You shouldn't be either, but I know how hard it is to live among the small minded and not shrink some yourself."

"My mother's ashamed," he said tightly. The discussion had turned painful for Danny, but it was also an unexpected relief to air feelings he'd always kept private.

"Daniel, I doubt that. But she's such a devout Christian that she couldn't bear the thought of her children being exposed to another faith. If she'd truly been ashamed she wouldn't have taken David's last name. Levan, you must realize, is recognizably Jewish."

"Is it? You mean *everyone* knows?"

She chuckled. "Not at all. Living among the ignorant has its advantages. And so far, obviously, none of our local gossips have caught on."

"So far," he repeated bitterly. "You know Mrs. Horne's nephew, Ozzy? That bully whose finger got cut?"

"Certainly. The Paynter boy. Haven't spoken with him since his family moved up to town. Something of an ill seed, I fear, but we can always hope."

"Well, somehow *he* figured out I'm Jewish and promises to pass the word if I don't obey his orders."

"Oh dear." She leaned forward to pat his hand again. "But I'm glad you told me. Don't worry overmuch. Lois Horne and I will put our heads together and come up with something."

She sighed. "In science, my young friend, a theory must account for every observed fact. Your idea has considerable charm and it conforms loosely to folktales, but it leaves a great deal unexplained. And frankly, as much as I've traveled, I've never encountered any actual *magic*. So we must ask ourselves a few hard questions. But first, would you care for tea and treats?"

After two still-chewy gingerbread equines, a raspberry scone, a honeyed cup of Smith's usual chamomile brew, and some hard thinking, Danny set out to support his notion.

"Perhaps even the golem's *pieces* want to protect me. And that's why Osric got pricked when he grabbed my shirt."

Smith took a sip before answering. "Then why did that first chip attack you?"

Danny was ready for that one. "We studied Dr. Landsteiner's blood-typing in school. Don't you suppose the chip might've been testing my blood, confirming I was the one it was intended to protect? My wound wasn't as deep as Osric's and he never actually touched the chip; it was in my pocket at the time."

She smiled. "I doubt Karl Landsteiner's excellent methods could reveal anyone's racial heritage, Daniel. But let's return to the beginning. Why would that first deposit of chips have remained in the woods for you to find? From everything you've told me, the pieces seem eager to rejoin their, ah, flagship straightaway."

"That's—I don't know."

"Suggests a certain flavor, don't you think?"

"What flavor?"

"Bait. And if they were waiting in that spot intentionally, we have to wonder if the location was coincidental. Then, you described those initial footprints as 'large.' If your golem is truly the giant you say, I should think 'large' would be quite the understatement."

He thought back. "Well, that *is* odd. I saw the golem's feet and they were *huge*. Could the golem have . . . grown since March?"

"Possibly. Or, from the way it seems constructed of independent pieces, perhaps it changed shape; coincidentally, the word 'golem' is Hebrew for shapeless mass. And certainly, logic suggests a

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close connection between those tracks and your visitor despite the change in size. Tell me, lad, do you recall the symbols on its forehead clearly enough to draw them?"

He nodded; the giant's face seemed etched into his soul. Smith fetched a sketchpad and pencil and Danny, chewing a lip, set out to reproduce the designs.

It wasn't too difficult. Each had a thick straight line connected in various ways with one or two thinner ones. He studied the result for a moment, crossed out one character, and redrew it more in accordance with his memory. Finally satisfied, he turned to Smith and was taken aback by her expression of astonishment and excitement. The idea of an immense plaster man wandering the countryside hadn't gotten her nearly so worked up.

"What is it?" he asked.

She cleared her throat and visibly calmed herself, but her eyes sparkled. "Hebrew, I should tell you, is written and read from right to left."

"What does it matter which way I—"

"It doesn't, because that isn't Hebrew."

His face fell. "Oh. Well, I've never actually seen any Hebrew. What language is it, then?"

She was too intrigued by this new development to notice his disappointment. "I'm not surprised you don't recognize it; neither did I at first. The thicker lines should all be connected and vertical since this is an inscription. And the thinner lines are turned every which way. What we are gazing at, my dear lad, is Ogham."

"What? *Druid* writing?"

"Any Druid would be very cross with you," she chuckled, "for referring to their tree runes as 'writing'! They didn't hold with writing—considered writing something of a leaky container for sacred thought and the surest way to ruin a priest's ability to memorize."

"But why would a golem be wearing Druid runes?"

"Daniel," she said gently, "we can hardly claim for a surety that your giant *is* a golem. But let's invoke assumptions far larger than your plaster friend and say it is. Perhaps the Druids had tea with some ancient Jewish wizards and borrowed the golem, ah, recipe. If so, wouldn't they just add woad to the batter and make it too stiff, so your giant couldn't move without breaking something! And perhaps, despite the needs of Druids, using Jewish magic could only produce a protector for Jews. I'm speculating wildly, lad. But one thing we do know: the Druids needed a protector!"

"From what?"

"The Romans, of course. Whatever are they teaching you in school?"

"We haven't studied Druids. My teacher says they weren't important."

Smith's only reply was to roll her eyes.

Danny studied his drawing again. "So what does this signify?"

"Ah! That's the question! What we see is three runes. Doesn't the first rather resemble the Greek letter pi, but with a larger hat? That's what misdirected me. As is, the rune is drawn manuscript-style: on its side. In an inscription, the hat should be a tree trunk to the left of the two slashes. It's *Luis*," she pronounced the word "Lweesh," "representing a rowan tree and the quality of protection."

"Protection!"

"Exactly. The rowan is associated with the Celtic god Cernunnos, which means 'the horned one,' a reasonable title considering his close connection with the Greek god Pan. And you mentioned that your golem has horns." She smiled. "You are already somewhat acquainted with Cernunnos."

"I—I don't think so."

"His Druid name is Hu Gadarn."

"Oh!"

"Now observe how the middle character has a thick line slashed evenly by two diagonal lines? Again, it's misoriented. But it must be *Gort*, which symbolizes ivy and conveys the quality of per-

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sistence."

"And the last rune?" This was a single diagonal intersecting a thicker line.

"*Muin*. A vine, usually blackberry or grape. It suggests both rebirth and insight."

"Luis, Gort, and Muin?

"Roughly equivalent to our letters 'L,' 'G,' and 'M.' "

"What do they spell, then?"

One delicate gray eyebrow lifted. "We're not bloated with vowels here, my lad. Given my, ah, pick of the litter, I could come up with several Celtic or Gallic possibilities, but left vowel-less, LGM isn't any word I know. Still, the combination of meanings—protection, persistence, and rebirth—could be significant."

"Of what?"

"I'm not sure. *I* certainly lack a theory to account for every fact. But surely the creature's similarity to the golem legend can't be accidental." Her eyes turned soft. "I only wish my Ned were alive right now," she murmured. "He adored anything that smacked of mysteries and miracles."

Danny eyes stung with empathy. "I wish he was here, too."

"You're a splendid lad," she declared. "But it's far too late—or early!—to flog our brains any further. Tomorrow, I shall meet you by the Sentinel and we'll examine the site together. Why look so surprised? I'm still spry enough to shamble my way through the Nemeton for an afternoon appointment. Go home and get some rest, dear."

"But there's still so much we haven't—"

"It will keep 'til the morrow. You must be flogged out. Go home."

In his bedroom, while changing into his nightshirt, he glanced down and realized he'd neglected to tell Smith about the small bump on his chest. But once under the covers, he forgot about the oversight and put the golem very nearly out of his mind as well. Was it possible, he asked himself repeatedly, that his mother *wasn't* angry with him for being Jewish? He fell asleep easier than he had in years.

Molly Levan had to shake her son repeatedly before he woke up enough to get ready for school. With a wistful expression that would have astonished him if he'd turned around, she watched him leave the house.

Once outside, he found the day pleasant and those fast moving clouds the old folks called "windogs" were romping in the sky. But lack of sleep caught up with him quickly. His walk through the forest seemed a walk through a mirage and class was a nightmare of tedium. Whenever teacher's back was turned, Osric Paynter grinned at him, rubbing his knuckles.

Despite the weather, Mrs. Wetzel was in a stormy mood and just before lunchbreak the class learned why. Some unknown student, she announced, had broken into her locked desk within the last several days and undoubtedly copied the answers to upcoming tests. She'd deduced the "theft" only this morning upon noticing papers out of order. She was furious because now she'd have to produce new exams, requiring extra work, and especially irked because the "burglar" might've perused confidential school records and her own private notes. If no one confessed to the deed, the entire class would suffer an onslaught of additional homework.

Danny glanced over at Osric who gave him a warning glare in return. It wasn't cleverness that had exposed Danny's heritage.

During recess, Osric grunted one word to Danny: "Later."

Worried as he was about broken bones, Danny thoughts kept vacillating between the golem and Professor Smith. Village women her age tended to be "brittle by agein'" and he could scarcely believe anyone so antiquated could traverse the Nemeton unassisted. The jour-

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ney would probably take her days!

And ever since he'd seen the giant's face, he'd been feeling an eerie *connection* to the creature, deep in the backwoods of his heart. And that connection kept tightening. A sense of endless striving was filtering in now, mixed with something like loneliness, which dovetailed with his own longstanding sense of isolation.

The rest of the school day was a blur. By the time class was dismissed, Danny was too drained to resent the assignments Mrs. Wetzel had heaped on at the last moment.

He was so dazed he almost forgot his books and rather than being the first outside as he'd planned, he wound up last in queue. When he realized Osric Paynter was long gone, renewed fear shook him alert.

He kept looking all about as he hurried toward the town's northern exit. Osric was nowhere in sight. Neither was the professor as he approached the Sentinel. Then everything seemed to happen at once.

The bully jumped out, leering, from behind a tree. And as Danny dropped his schoolbooks and spun to face his enemy, something nearby began hissing as if a steam pipe was leaking.

Osric was too wrapped in spite to notice. "There ye be," he declared with great satisfaction. "On time for the beatin' o' yer—" His jaw dropped and his eyes bulged.

Meghan Smith stepped into sight of both boys; she'd evidently been behind the Sentinel, on its western side. But the bully's shock had nothing to do with her sudden appearance. . . .

A horde of something resembling violet ants was welling from the shadowed ground abutting the massive rock and mounding up between the two boys. In moments, the pile was taller than both boys combined and had unified into a recognizably human shape. It smelled like a newly opened grave. Danny stepped to one side to keep Osric in view.

He glanced briefly at Smith, who was observing the reassembly with the absorption of a toddler with a new toy. Her usually pale face was flushed and her eyes gleamed behind the round lenses.

Then she gasped, "Watch yourself, Osric!" when the completed monster suddenly leaned over Ozzy, raising high an arm thick as a tree trunk. The bully dropped to his knees, pummeled by a hailstorm of rubble.

Danny was horrified. Since his first look at the forehead-runes, he hadn't considered the giant dangerous. Now fright turned his mouth sour and coppery. Ozzy squealed, the great arm swung down, and Danny screamed, "STOP!" so hard he felt something tear in his throat.

The massive fist halted with impossible abruptness and the giant froze as if the gears of time had seized up.

Everyone else seemed equally paralyzed for a moment. Slowly, Ozzy craned his neck to see the plaster club suspended an inch over his head. Still half crouching he scuttled off toward town, whimpering, chips rattling off his back, shoulder, and falling from his hair. The chips scuttled almost as quickly back to their motionless source.

"I daresay," Smith remarked calmly, "there goes one chap who'll trouble you no more."

Danny's chest felt hollow and cold from the strangeness of it all. His throat hurt. "The golem," he whispered. "It obeyed me."

"So it did. Have you any idea why?" When he didn't answer, she pulled out a journal and slowly orbited the golem—examining it, even touching it from time to time, sketching and scribbling notes.

"It wants us to wait here," Danny announced after a few minutes.

Smith paused in mid-scratch. "How in Heaven's name would you know that, lad?"

"I—I just know."

"That's most—ah! We seem to have

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company pending."

Two townspeople—a tall ruddy-faced man holding a rifle and a plump fellow with a drawn pistol—had appeared in the gap between town walls and were venturing north, albeit in no great rush. When they were finally close enough to the golem to see every detail clearly, but not too close, both stopped to stare at the huge inert figure. Within a minute, their expressions evolved from fearful, to wary, to annoyed. The tall man lowered his rifle, took a few more steps toward the Sentinel, and turned toward Professor Smith.

"I know ye, Ma'am. Do ye know me?"

"Certainly. We've met several times. You're Constable Ryan."

"Aye. And n'un else." He rested the rifle's butt on the ground. "Oz Paynter just came to me cryin' o' ogres in der woods. Is *dis* rubbish spang in der middle of ourn footpath Ozzy's bloody ogre?" he demanded. "Is't some gippo prank?"

"I doubt Gypsies were involved," she said.

"Gippos ben't welcome here!"

"'Tis a scu'pture, Harry," the chubby man expounded, shoving his pistol into its holster, "and mortal rough work at that. Italian or French, no doubt." He sniffed. "Been long buried, too! Has summat of a stench."

Ryan stepped up to the golem and gave its extended arm a hard shove; it didn't budge. "How did it cum here? Who'd make such a homely thing? Do you know ought about dis?"

"Blame the Druids," Smith suggested.

Ryan just snorted. His companion remarked, "No lazy task, gettin' *dis* trash carted off."

"Right c'har, Andy. So let's be headin' into der park. Summat this heavy means wheels and weight on wheels means tracks ter follow wherever soil be softer than here. Ourn gippos can't hide for long."

The men stepped around the obstruction and continued on their way.

"'Be headin' might improve some people I could name," Smith muttered.

Her final word was punctuated by a series of brittle pings and cracking sounds as the monster resumed moving. It stepped close to the Sentinel, lowered itself to the earth, and began smashing its body apart as it had done in the early morning moonlight.

Its particles, demoted to ant-size, flowed like a retreating wave under the curve of the Sentinel and vanished into the ground, leaving behind a faint powdery residue. Danny and the professor stared at each other until a deep grinding noise pulled their eyes back to the boulder.

As they watched, the massive rock slid two yards to one side, revealing a large vertical hole or tunnel, rectangular and quite dark, leading into the ground. Suddenly the air stank of moldy humus.

Danny wrinkled his nose although the smell was already diminishing. "We're meant to go down there."

"Oh?" Smith turned to study the boy's face. "Who, exactly, means us to do so?"

"I don't know."

"Curiouser and curiouser, although I admit this opening does appear rather invitational." Smith got on her knees to peer into the hole. "But your golem makes a poor excuse for a hare, and I'm not as brave as Alice. Can't see very far down, but without a ladder or staircase we'd surely wind up like Mr. Dumpty."

"We just have to wait a moment longer."

Smith rose and brushed dust off her dress. "Something else you just 'know'?"

"I can feel it."

She frowned thoughtfully. "Well, our golem *did* mind you although it seems unlikely such a being would understand English. I suppose it's conceivable you've developed some sort of... mystic link, although I dislike being so fanciful. But if magic *is* behind all this—which would quite astonish me!—the runes could play a part."

"How?"

"I'm thinking of Muin specifically.

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Vines attach themselves to whatever they can, so if you . . ."

Her voice trailed off. The hole was no longer empty. A small violet crescent was rising from the darkness, clinging to one side of the shaft. When it reached the top, it expanded to a disk nearly filling the opening.

"That's for us," Danny stated, stepping forward onto the disk before Smith could react. The disk immediately began sinking. The boy heard a word that would've startled Smith's former students, and the woman landed beside him.

She rubbed her knees, remarking, "My Ned always said, 'Never hesitate when it's time to take action; decisions are for moments of leisure. When you're up against it, *do* or *don't* do, that's all.' Alas, he failed to take antique joints into account."

Overhead, the boulder was gradually sliding back in place, cutting off the light and again releasing a pungent earthy aroma. Danny looked up and got a brief look at the Sentinel's moldy underside. The golem's pieces, he thought, must brush against all that muck on their way out. I suppose that's why the giant reeks!

The smell faded as they dropped. And by the time the tunnel was utterly dark, the air smelled post-thunderstorm fresh and the temperature had soared to mild. "I'm glad you chose to do," Danny said, his enigmatic certainties temporarily absent. "I wouldn't fancy being alone right now. We're still going down, aren't we?"

Smith voice was a trifle too calm. "I believe so, although this is the gentlest lift I've ridden. Pity I hadn't thought to bring along a torch."

As if in response, a faint click and a gentle crackle heralded curving lines of cobalt light suddenly appearing on the walls around them, providing a cold but adequate illumination. They were indeed still descending and while their "lift" hadn't expanded further, the small tunnel had swollen. The disk was gliding down one wall of a space as large as a major mineshaft and Danny felt the lack of a guardrail acutely.

He was startled at the way the bluish light was turning Smith's face a ghastly green. Examining his hands, he found the skin equally verdant with one major difference: hers didn't sparkle with countless points of brightness as if filled with stars.

He moved forward cautiously to peer downwards, over the disk's edge. "We're getting close to the bottom. What kind of place is this? Do you suppose Druids built it?"

Despite what must have been severe misgivings, Smith managed a chuckle. "Heavens, no! And if they had, I trust they wouldn't have installed electric lights. I rather suspect we've stumbled into an important military secret, although what role your golem plays in this I can't imagine. Ah, we've stopped."

They stepped carefully off the disk onto a gray surface that felt a bit soft underfoot and looked around. From here, they could see horizontal tunnels running in several directions. A clattering made them turn around.

The disk was lumping up into a humanoid shape, similar to the giant's form but smoother, far smaller, and without horns. It emitted no noticeable odor. When the process was complete, this toy golem strode past them and it didn't crack or break apart. It stopped at the opening to the widest tunnel and pointed inside with one plaster-like arm.

The creature's message was clear and its former passengers followed it into the tunnel without discussion. The instant they stepped inside, the cobalt tubes around them bloomed into white radiance, which appeared yellow-orange to their eyes until they adjusted to the fuller spectrum.

The curved walls here were broken by a series of large alcoves on both sides. Each alcove contained a long white table or slab supporting a coffin-shaped transparent box with what appeared to be a corpse inside. On impulse, Danny de-

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toured into an alcove and Smith joined her. Ahead of them, their bizarre guide stopped and waited patiently.

For a corpse, the naked man in the box appeared improbably fit and healthy. He was extremely tall, with a sprinter's well-defined muscles, short black hair with touches of gray covering his head and pubic bone, a slightly Asian cast to his handsome features, and either naturally dark skin or a deep tan.

The next two alcoves held female corpses whose tall bodies were equivalently idealized, and a second flawless male specimen occupied the fourth. They all appeared similar enough to be siblings and such repeated perfection made them seem more like sleeping gods than dead humans. But none showed any sign of breathing. Danny was embarrassed by the nudity, but that didn't stop him from staring.

A third man was sitting on the empty box in the fifth alcove. He was wearing a white robe and his smile revealed brilliant white teeth. His feet were bare. "My chronometer tells me it's 1937," he said with an accent Smith couldn't identify. "So I've been waiting for you," his grin widened, "for two thousand years."

"I'm sorry," Danny whispered. "Did you say two *thousand* years?"

The man laughed and jumped down from the box. "A shameless exaggeration. I thought it would sound more dramatic to round up by a century." Standing, he was even taller than Danny had expected and seemed to tower over them.

"You know," he continued, "I wasn't expecting two of you, but I welcome you both on board." He performed a deep bow. "I'm Lieutenant Jay Moreno."

Smith's lips worked silently and for a moment Danny thought she was too shocked to speak. But a lifetime of politeness can have a useful momentum. "Ah. My name is Meghan Smith and—"

"Of course! Dan's childhood friend, the archeologist! I read your book on Egypt, Professor—great stuff. And you," he turned to the boy, "have to be Daniel Levan."

"How—how do you know my name?"

"I'd better know it. You're the reason I'm here."

Smith frowned. "I haven't been granted a professorship, Lieutenant, nor have I written any books. My late husband is the one who—"

"Don't worry, you'll get 'round to it." His chuckle was warm and pleasant; the man radiated cheer. "I'm sorry, all this must be confusing as hell. Let's go someplace where we can talk more comfortably and I'll try to explain. There's a lounge just around the corner and we'll see if Nanny can find you a snack and maybe brew up some tea—if previous visitors haven't used up all our, um, party supplies. If only *I* could have a snack—I'm starving! Don't worry about the cadavers; they're all very much alive in a kind of long-term hibernation."

"Why can't you eat?" Danny asked.

Moreno chuckled again. "No time to digest. If I don't return to stasis within this hour, I'll have to undergo the conditioning process from scratch, a long and nasty job that could be bad for my health. Fatal, even. Besides, my intestinal tract already holds a grudge against me for going through conditioning once."

"I still don't—"

"Even in stasis," Moreno explained, patting his abdomen, "food exposed to stomach acid gets ugly after a few centuries. But it won't hurt me to *smell* food and think jealous thoughts while I keep you company. Come."

When they left the alcove, the small golem was gone.

The lounge was a small room with chocolate-colored walls, rows of pastel lights in various hues set into the ceiling, and it held a dozen silvery chairs resembling huge toadstools. The bland gray floor was interrupted by large brown polka dots set between groups of chairs. Moreno lowered two toadstools to appropriate heights by means of a side-

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lever and everyone sat down, Smith with due caution.

"Who is Nanny?" she asked after concluding she wasn't about to slip off the unexpectedly soft surface.

"The purple thing that led you to me."

"Ah. Your servant?"

"That's an odd way to put it. Nanny is—I'm not sure how to say this so it will make sense to you. It's basically a machine. A very sophisticated machine made of microscopic pieces we call 'nanines' that can work independently or join together into forms as large as . . . well, me for example."

"No larger? Smith asked, exchanging a puzzled glance with Danny.

"My mass would be about the limit for a single unit but we might have fifty or more such units operating at a time."

Danny shook his head. "But we've seen your Nanny before we came here. Only then it was tall as a rowan."

The man's eyebrows rose. "That's just not possible, Dan. If that many nanines tried to hook up, the resulting construction couldn't move without falling apart."

"Well, it *did* move. And small parts of it did keep breaking away. Constantly. But those parts kept coming back together again."

Smith nodded. "Haven't I seen this with my own eyes, Lieutenant? Daniel is quite right, the thing was immense."

For the first time, Moreno seemed unsure of himself. "Let me check this. It'll only take a second."

He turned in his seat and although he then appeared to do nothing more than stare at a wall, a glowing rectangle appeared on the brown surface. A series of pictures flashed within this rectangle in rapid succession, mostly images of the Nemeton near the Sentinel. The parade ended on a picture of the giant as seen from the back and Moreno grunted in surprise. Again, he seemed to do nothing, but measuring lines appeared on the image, marked in meters and millimeters. Then thin wedges of the giant's torso began vanishing as if they were being sliced off, leaving exposed cross-sections.

"How about that," Moreno murmured. "Nanny made itself *joints*! Crude joints, but good enough for their purpose. Hell, I suppose it's had time enough to learn a few new tricks." The creature was suddenly fully restored and the image became animated. Now everyone could see exactly what happened when the giant moved.

Moreno spun toward Danny. "Do you . . . think a lot about giants?"

"No. Not until lately. But I used to dream about them every night."

"I don't get it. We've obviously established a good connection between you and Nanny, but it shouldn't be strong enough for Nanny to model your old dreams."

Smith felt as if her mind was returning from a long vacation inspired by a series of shocks. "Lieutenant," she said. "Just what is going on here? What kind of installation is this? Why did you welcome us 'on board'?"

The man's eyes glowed as if these were the very questions he'd been waiting to answer all his life. "This is going to be tricky to explain, but I count myself lucky. Commander Beale had to deal with the same issues back when Claudius was ruling Rome!

"First off, this, um, building around us is a time machine—time-*travel* machine; I should say. Also a time capsule, spaceship, and excavator. It's named the *Hourglass*."

"Time machine?" Danny tried to catch Smith's eye but she was looking about as if seeing the room for the first time.

"Your friend from London, Professor! The one who divorced his cousin to marry his student." Village gossip being what it was, this antique scandal was almost everything Danny knew about the man. "Didn't he write about this?"

"As a pretext for social commentary, lad, but I've always thought Herbert's premise rather silly," she answered in a

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distracted voice. "I've just never cared to hurt his feelings and tell him so."

Moreno's jaw dropped. "You *know* H.G. Wells?"

"Certainly. Lieutenant, are you really claiming that this structure can take us to any moment in history we choose?"

"It's not so accommodating, Professor. But it can take us to certain specific moments."

"Time travel," Smith muttered, shaking her head. "I've always thought of time as merely a human invention, our way to measure duration."

Moreno nodded approvingly. "A valid perspective! But there's a fellow living in Princeton, New Jersey right now who came up with a broader concept of time as a . . . physical dimension in which all duration occurs."

Smith gave him a wry look. "Even in darkest Sussex, Lieutenant, we've heard of Professor Einstein. Still, even if time *is* a dimension, how could you possibly ride back and forth on it as if it were a set of train tracks?"

"Well. The physicists of my day took ideas from Albert Einstein, Fritz Zwicky, a fellow named Edward Witten who'll be born in another, um, fourteen years, and a host of other clever men and women, and proved that time is a—a membrane of sorts with two dimensions. A *flexible* membrane shaped, in part, by gravity."

Danny was scarcely following this, but he'd grasped one central fact. "You're from the *future*?"

Moreno chuckled and managed a sitting bow. "That I am."

"Then why did you say you were you waiting for us for two thousand years? Did you mean two millennia . . . ahead?"

"Not at all. I'm getting to that."

Smith's face was lit with pure fascination. "Time itself is flexible?" she said encouragingly.

"All analogies are dubious, but think of a very large and thin rubber sheet suspended in midair. Put some small but heavy rocks on it here and there. As fabric stretches under the rocks, it forms conical tubes. Now imagine two rocks the same size, but different weights. The heavier rock obviously produces a longer tube and, what's more relevant, a narrower one with thinner walls. Do you follow me?"

Smith nodded.

"Good. A time-membrane associated with a sufficiently massive galaxy, such as ours, gets distorted. Distorted enough to almost touch itself at specific, um, points. At those and only at those points, it's possible to jump directly from one part of the fabric to another."

Smith closed her eyes for a long moment. "So you need a spaceship," she said at last, "to reach those places where the fabric is close enough."

"It's not really a matter of being in a specific *place*. But you need to calculate the exact moment to act practically down to the femtosecond! The *Hourglass* has to be a spaceship, and one hell of a fast one, because the Earth itself is something of a spaceship.

"Right now it's moving around the galactic center at over 220 kilometers per second, and it's zipping toward a region of space our astronomers call the Great Attractor at around 1000 kilometers a second. You see? Between May 5th, 39 ACE—you'd say A.D.—when we arrived here, and July 12th, 2175, the date the *Hourglass* will leave Tucson, Earth will have gone a *long* ways. If we pretend that space isn't another kind of rubber sheet doing plenty of its own stretching, we're talking over eighty-two *trillion* kilometers. And that's ignoring orbital and other trivial motions."

"Sounds rather a lengthy trip," Smith observed.

He chuckled. "I'll say! Even in a tub that can travel at a quarter light-speed. But that didn't matter to my shipmates or me; we slept through most of it and let Nanny do the steering. And of course we choose a pinch in time that would give us the time we needed to get here at the time we wanted."

"Golem's coming," Danny announced

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a moment before the toy golem, or a similar one, strode through the doorway bearing two cups of steaming tea, small containers of milk and sugar; and an assortment of crackers, cheeses, flatware, and pastries on separate plates. Rather than a traditional serving platter, the golem had extruded six extra arms to manage so many dishes. Smith shuddered a bit at the result.

As the creature approached their chairs, the brown circle on the floor between them rose up to reveal itself as a table. Nanny served tea without ceremony, placed the plates on the table, and then stepped back to wait by the doorway. The creature grew a few inches as its extra arms shrank to nothing and Danny felt its rising urgency as if it were his own.

"I suppose Nanny's nagging me to hurry," Moreno stated. "Please help yourselves to anything you like."

Smith sniffed the tea. "Darjeeling, I believe." She ran a fingertip thoughtfully around the saucer's rim. Every plate, cup, and utensil was the same bright violet. Neither guest made a move to sample anything.

Moreno seemed to guess Smith's thoughts. "Yes indeed. Bring Nanny along and you won't need to pack spoons for your picnic. Nanines are wonderfully obliging, aren't they?"

"Quite," she admitted. "Lieutenant, what you've told us so far has been most intriguing. But I can't help wondering why you've gone through all this bother. What, exactly, do you want with Daniel? And what's his connection with this Nanny?"

Moreno nodded seriously. "I give you both my word. Dan: we mean you absolutely no harm. But we do need your help."

"For what?" Danny asked.

"To correct a serious mistake." The man from the future took a deep breath. "Where I come from, we've learned more than you'd believe about how the human body is constructed. We can put human genes, or the genes of any Earthly plant or animal, together any way we damn please. We've changed the world! And to some degree, we've altered human nature."

Smith's eyes had narrowed. "To what end?"

"We've all but eliminated birth defects, diseases, and defects of any kind—physical, intellectual, or emotional. We've taken the best parts of all races and combined them to make people stronger, healthier, and happier. In my world, we have no strong racial biases. In fact, most of us treasure those variations in people that still exist."

"It sounds a paradise," Smith said.

"It is! And we haven't forgotten human history, so we know how lucky we are. We've learned to live with each other and with the world around us *gracefully*. And we've largely replaced laws and armies and police with a powerful sense of individual ethics."

"So where is the snake hiding in this paradise?"

His smile lost some sparkle. "Professor, after nearly a century of perfecting our genetic makeup, long-running psychological tests have proved we are steadily losing something. Something perhaps as precious as anything we've gained: raw creativity. We're getting fewer and fewer artists of any kind. And the, um, wellspring of new ideas, which has carried the human race from caves to the stars, is drying up. Turns out some of the weaknesses we've culled from the common gene pool may not have been weaknesses after all." He sighed. "To use one of your folk sayings: we seem to have discarded the baby with the bathwater."

"Not one of *our* sayings," Smith observed. "Perhaps happy people are simply less creative."

"Believe me, the tests compensate for that. Even our most miserable people tend to be less creative then their grandparents. The trend is unmistakable."

"How can Daniel possibly help you?"

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Moreno glanced at the golem and leaned toward Danny. "I was supposed to study the scans from every case, but you showed up before I could get to yours. Not my fault; Nanny roused me too late—" he snapped his fingers "—probably because so many nanines were tied up playing giant outside the ship! So I can't even guess how much of this you'll be able to take in. But here's the story:

"You might picture this ship as a . . . temporal train, which arrived at this spot in 39 ACE and dug in, a decade before Cogidnubus began building Dun Hugadarn. In 47 we came to our first 'stop,' a weaver named Elenor Fletcher. Everything worked out. A year later, Nanny approached the next subject, a forest priest named Belwether—"

"You mean a *Druid*?" Danny asked.

"Right. Belwether had a highly unusual mindset and our normal procedures flopped, but Nanny managed to communicate with him anyway by learning a Druid code and scratching symbols in the dirt. You have no idea how crazy that is! Nanines are designed to be adaptable, sure, but not *that* adaptable. Anyway, I could go on but do you see what I'm getting at?"

The boy shook his head. "No. Not at all."

"Dan, you're another stop. Our fifteenth and final one."

Moreno shifted in his seat as if it had suddenly become uncomfortable. "The way Nanny operates is to first send out nanine spies to gather information about our chosen subject. Then it tempts the subject to pick up a nanine-cluster large enough to contain a few drops of blood." He met Danny's gaze with troubled eyes. "This is where we've had to, um, stretch our ethics and I'm not proud of it. Anyway, the cluster forms a lancet, takes a blood sample, and brings the sample to our lab where Nanny analyzes it. Using this data, Nanny coats thousands of nanines with proteins duplicated from the subject's natural proteins."

Danny looked at Smith to see if she was making sense of this but couldn't read her expression.

"The coated nanines," Moreno continued, "form a new cluster and the cluster goes in search of the subject or simply puts itself in a place where the subject is sure to find it. Nanines can form themselves into anything small the subject might find interesting enough to pick up and take with them, such as a fancy ring or a—"

"That little chip I found lying all by itself!" Danny said, excited to have made the connection.

"You found a plain *chip* interesting? That's unusual." The lieutenant wiggled an accusing finger at the golem. "I really wish I'd had time to study your case. But if you're talking about a second encounter with something small and violet, it had to be the cluster of coated nanines. What did you do with this chip?"

"Put it in my pocket."

"And the next time you looked at it, it had shrunk. Right?"

"Yes!"

"Here's what happened: several thousand individual nanines separated and traveled right through your skin and into your bloodstream where their coating tricked your body into thinking they were part of you. From your blood, they spread throughout your body to become a temporary extension of your nervous and endocrine systems."

"You mean—they're *inside* me right now?" The boy looked down at himself in alarm.

"Don't worry! They won't hurt you in any way and they'll be leaving soon. I promise. But I truly regret doing this to you without your knowledge or permission."

Danny believed him. Not only did the man look and sound sincere, he was blushing. "But what are they *doing*?"

"They've set up a—an emotional bridge between you and Nanny. You could think of the nanines within you as little radios, talking back and forth with

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Nanny's larger units."

"Radios?" Danny cried. "Radios are *big*."

Moreno smiled. "Not where I come from."

"Lieutenant," Smith said, "you still haven't told us what you want."

"Right. Dan, we'd like to take three small tissue samples from you, but our ethics don't stretch far enough to do it without your consent. The operation won't hurt, but you'll have some tender spots afterwards and have to wear a few bandages for a day or two. But, if everything works out, you'll be doing something tremendous for humanity."

"I don't understand."

"I'll try to be clearer: we want to bring a part of you with us and share it with future children to help them develop full creative powers."

"If that's all you want," the boy asked slowly, "why *wouldn't* I agree to it?"

Moreno looked at Smith. "A sophisticated question from someone so young!"

"And a good one," Smith pointed out.

"It puts me on the spot, that's for sure. Okay, I'll play devil's advocate, Dan; that's only fair. Here's one reason you might turn this down: you'll get no say in how we use your genetic material. In a sense, we're asking you to share your genetic heritage and then trust us to do whatever we please with it. And your decision today is likely to eventually affect . . . well, *everyone*."

The word "everyone" echoed and reechoed in Danny's mind, seeming louder with each repetition. He felt as if he were standing on a vast stage, dark except for a single spotlight blazing down on him alone. And countless eyes were watching.

And he knew something in his bones beyond his power to express: this act of judgment was important enough to be crucial to his own future, whatever its effect on Moreno's world. It would shape him into a rough approximation of the person he would eventually become and carve defining letters into the forehead of his soul. . . .

"I'm only thirteen. How can I decide something like this?" he begged.

"That's up to you," Moreno said gently.

Danny turned toward Smith. "What would *you* do?"

She watched Moreno watching Danny for a moment before she said, "I'm not at all certain."

"Please. I need your advice."

She looked down at his hand on the tabletop. They were clenched and trembling. "I'll try my best, Daniel, but this is beyond me. I suppose you might begin by asking yourself some questions. Do you believe what the lieutenant has been telling us?"

"I—I think I do."

"Ah. Ergo you trust him. Do you find his stated purpose here a worthy one?"

"Yes. Very much so."

Her eyes grew more intent. "Then perhaps only one issue remains: how much do you care about the human race? Do you care enough to help?"

Danny wanted to say yes, but when he tried to think about humanity in general, what sprang to mind was Osric Paynter's sneer. Wasn't the world full of bullies and brutes, people capable of atrocities! Just a few years ago, human monsters had ignited an immense war and caused unspeakable suffering. Danny's mother had even warned him it might happen again!

He couldn't imagine the future Moreno had described, but the past showed humanity in a horrific light. Even right here in peaceful Sussex! Nearly two millennia ago, hadn't Romans been trying to kill off the Druids, according to the professor? Hadn't people always gone through history carrying cruelty and intolerance along like favored pets? His father's people—*his* people—the Jews had been battered by endless prejudice. . . .

Then there was Meghan Smith. Her kindness and wisdom seemed the anti-

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dote to the human poisons of intolerance, arrogance, and hate. And what about his mother; his grandmother; John and Dorothy Burry, the generous neighbors across the street; and all the splendid people he'd read about in school such as Dr. Schweitzer?

"What are you thinking," Smith asked softly.

He gazed back at her steadily. "I'm thinking that hating people who hate is still hating. And I *do* care about the human race, or at least enough of it. Even if bad people far outnumber the good ones, now and forever, I still want to help the good ones. And who knows, maybe more creativity could make the bad ones a little better."

Moreno beamed at him, but Smith's eyes were shining even brighter.

"So your answer is yes?" Moreno asked with obvious delight.

"Yes, but I also want something. I want you to help Nanny."

"Help it do what?"

"Be less sad."

Moreno's smile was warm despite a trace of condescension. "Dan, Nanny is only a machine. We've made it capable of learning and independent action, but it doesn't have emotions. It doesn't feel anything."

Danny frowned at him. "How would *you* know? You didn't believe it could act as a giant. And you were so amazed it had learned Ogham. If it's been here since the Druids, hasn't it had time to—to . . ."

"Evolve?" Smith suggested.

"Become a *person*," Danny insisted.

Moreno tugged on his lower lip. "That's an interesting thought. This is the first nanine team functioning for anything close to this timescale, so maybe I shouldn't be so sure of what it could become. And truthfully, you're in a position to know more than me about Nanny's current, um, state. What do you think it's feeling?"

"It's spent too much time alone. It's been lonely and it knows it's going to be lonely again. And it's terribly worried about you. It wants you to return to your box."

The lieutenant swiveled toward the golem. "You've been *lonely*?"

The artificial creature didn't react in any obvious way, but Moreno seemed almost grim when he turned back toward Danny. "Unfortunately I can't help Nanny right now except by hurrying up, but when we get home, I promise to look into this."

"Please do. So what do we do next?"

"Get the samples."

"What," asked Smith, "will you do with them, exactly?"

"They'll be surgically installed in me for safekeeping. We can put tissue samples into stasis for a long while, Professor, but not for 238 years outside a living body. The genes will be studied when we get home and some will be carefully added to the public gene pool."

Moreno's lips twitched and his eyes twinkled. "One more thing, Dan. Now that the information can't pressure you into going along with this, I'm free to tell you why I'm the one assigned to your stop. With proper precautions, you and I are physically alike enough for your cells to survive in my body."

"You and Daniel are *related*?" Smith exclaimed.

The lieutenant grinned. "My, you're quick! I'm his great-great-grandson. With seven more 'greats' in front of it."

Danny stared at Moreno. He couldn't see the least family resemblance and wasn't sure how to feel about the revelation. "Why was *I* chosen?"

"This expedition is targeting raw creativity and our family once had an abundance of it. I'm not supposed to talk much about your future, but you're going to do some highly creative things in your life. And the same goes for your children."

A memory made Danny's eyes light up. "My father told me I've an older cousin from Pittsburgh in the States, a pianist who writes music for Hollywood."

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"Right. His name is Oscar and his surname is similar to yours. He'll become fairly famous and much later be rediscovered as one of the truly original minds of this century."

"Why didn't you choose him, then?"

Moreno waved a hand around. "Once buried, a ship like this can't be moved. So we're limited to people approachable from this area, which proved the best spot on Earth to, um, maximize our client list. Besides, Oscar Levant has some, um, personal problems you don't."

The small golem took one step forward.

"I can take a hint," Moreno grumbled. "But there's still time for you to have a bite or two. This food here was put in stasis *and* frozen. Wouldn't you like to sample a pastry that won't be made for another two centuries? "

Danny was gazing at the Sentinel. "He didn't tell us to keep this a secret."

"He didn't," Smith agreed, "and I imagine it's rather the biggest one on Earth right now. But they seem rather thoroughgoing historians in the future, don't they? Knowing exactly where and how to find their fifteen chosen subjects, and knowing which subjects to chose! I daresay if their ship were due to be disturbed, they wouldn't have put it there. Just whom would we tell, anyway? And what purpose would we serve by telling anyone?"

"I don't know."

"And what would someone find should they began digging here? Only a titanic rock, I imagine, its exterior similar to the Sentinel's, which must be part of the ship. The lieutenant said the *Hourglass* would be sealed until it returned home. I hope its air lasts!"

"But how will it *get* home? He also said the ship was stuck."

Smith laughed. "That's the easy part, lad. It just needs to sit and let the years pass. Perhaps they'll emerge before they left! No, probably not. Otherwise the lieutenant would've known far more than he did."

Danny sighed. "Part of me wishes I were inside, on my way to the future."

"Understandable, but it may not be quite as pretty as the lieutenant made it sound."

"You think he *lied*?" he asked.

"Not directly. He seemed quite guileless. But I suspect he left out a great deal."

"Such as?"

"It could be merely a matter of tradition. But if his world is so sweet and peaceful, why should travelers on the ship have *military* titles?"

"Oh."

"And mounting this expedition must've required such effort and expense—I rather expect more than human creativity is at stake."

"What?"

"I don't know, but I found the way he spoke of 'individual ethics' worrisome. I wonder if our species, with the best of intentions, will someday don a sort of mental straitjacket and need to get free. Did you notice the man blushing when he mentioned stretching his ethics?"

Danny looked stricken. "Should I have turned him down?"

Smith took off her glasses, pulled a cloth from a pocket, and wiped them clean. "By no means. I just doubt the lieutenant revealed the whole story. Tell me, Daniel. What are you feeling right now?"

"I'm not sure. A bit lost. I haven't been able to . . . sense the golem ever since those tiny bugs left me."

"Ah."

"I'm afraid the golem feels the same way."

"Your caring does you credit."

"I still don't understand why it made itself look like the golems in my dreams and placed those runes on its forehead."

"Perhaps to tell you something, and apparently it had only learned one written language."

Danny spun around to face Smith.

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"What was it trying to say, then?"

"That it was your friend, I think. Your dreams may have frightened you, but you knew golems only exist to defend Jews. And it even incorporated the horns of Cernunnos the protector! And ponder the meaning of those runes: protection, persistence, and rebirth."

"Oh. It was describing its job, then?"

"The rebirth of creativity? Quite possible. Perhaps it's my own sentiments tricking me, but I believe the runes were a statement of commitment to you . . . and your offspring. Given such responsibilities and so much time, I think loyalty has grown within Nanny from an acorn to a grand oak."

Danny nodded and turned back to face the stone before Smith could see what was in his eyes.

The professor waited silently, the cool breeze tangling her fine long hair. After a few minutes, she buttoned her coat to the top, slipped gloves on her thin hands, and tucked them under her arms for extra warmth. If she was uncomfortable, she still refused to complain or hurry the boy in any way.

The sky was tarnishing toward sunset, increasingly draped behind a film too thin and widespread to be considered a proper cloud, but thick enough to drizzle now and then.

Perhaps Danny would've stood silent for hours, but the constable and his plump shadow passed by on their way back to town and Ryan nudged the boy roughly, saying, "Still dere?" in a tone suggesting Smith and Danny were violating most of the Ten Commandments. "What happened to der gippo trash?"

Smith took over smoothly. "We don't know, Constable. After you left, we went into town and have only now returned."

"Well, ourn search was time burned and no mistake." The two men trudged on, muttering threats against non-existent gypsies.

Danny watched their retreating backs, finally noticing the cold. "People can be so cruel and people suffer so much," he said, shivering a bit, "and someday we'll be able to make *creatures* that suffer. Will human beings ever really change?"

Smith stepped closer to the boy. "I don't know, but haven't we seen hopeful signs today? Did you notice anything *unusual* about Lieutenant Moreno?" She laughed. "Aside from his height and beauty?"

"What do you mean?"

"Such a lightness of spirit! And a remarkably humble mind. Imagine you visited the early eighteenth century. Wouldn't you feel certain you knew more than anyone you'd met?"

"I suppose so."

"Yet whenever we contradicted him, the lieutenant found truth in what we were saying." Her eyes narrowed. "But something aside from cruelty and suffering is troubling you, isn't it?"

"Yes," he said heavily. "I really believed the golem was magic and my father had sent it. I'm a fool."

"Truth be told, lad, I'd started wondering myself if your ethnic heritage was involved. I've been getting the most appalling letters from my colleagues in Germany . . . If you're a fool, I'm five times worse, because I'm five times older. But Daniel," she put a chamomile-scented arm around him, "your father had everything to do with this."

"He did?"

"Of course. Where do you suppose your genes came from? And we've had some jolly good news today, haven't we? Not everyone knows they're fated to *have* a future! And yours even contains children! Now we should really be getting you home. And you'll agree we must have a convincing story at the ready explaining why you're late. Any ideas?"

By the year 1938, at a time when his peers were painfully self-conscious and unsettled, Danny was learning to face his life head on. And when he did look downward, it was mostly when near the Sentinel, from thinking about what was waiting below. ■

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Change

Julian Flood

How gladly should one suffer obvious fools?

They had nearly got to the farm when a particularly powerful gust sent a tree crashing across the track in front of the steamer. The engine hissed a little as the older man closed it down. Professor Airmith, whose face was familiar to anyone following the increasingly acrimonious climate change debates, waited for the boiler to lapse into silence before removing the key. Turning round, he rummaged among the junk on the back seat for his rubber waterproof. The wood trailer chuntered to itself for a few seconds, using battery power to crush some starting chips before falling silent, the feed hose throbbing briefly as the chips were blown through to the boiler intake hopper.

"It's by foot from here. That'll take chainsaws or heavy lifting gear. And by now we'll be blocked in behind."

Ed hauled his reporter's satchel from the seat beside him and stepped out onto the leaf-strewn road.

"No sweat, Prof. I can see the farm through the trees."

A particularly violent gust shook the trees of the orchard, sending a spatter of acorns rattling through the branches like hail.

"I hope the steamer will be all right." The professor closed the door uncertainly, looking small and lost against the tossing sea of trees, which enclosed the track.

"As safe here as anywhere. You heard the reports; there are trees down all over the state. This'll match the big blow in . . . what was it? '95?"

"Yes, '95. Before that '89. Before that '44. Eight hundred years before that . . ."

"Yeah, okay. I see your point, Prof. The climate's changing and the rate of change is accelerating."

"The evidence is all there, Ed, you can't deny it. You—well, okay, not you personally, but your side has run out of excuses. The data's beyond reproach. Average temperatures are changing."

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They clambered over the fallen giant and set off side by side, the familiar argument settling in as steady as their stride.

"No one's denying that, Prof. You—your generation of climatologists—all think that's it's anthropogenic. We say it's happening because that's what climates do. Look at the historical records. Temperatures fall and temperatures rise. Ten thousand years ago, this whole area was under a glacier. Five thousand years before that, there were crocs in the river and elephants on the banks. Man has nothing to do with it." A splatter of raindrops swept down the road, driving like needles into their faces. Ed stopped and put one hand on the old man's shoulder. "Here, put on your coat. It may be summer, but the temperature's way down in this wind. Get too wet and you'll get hypothermia." He took the coat from the other's hand, held the collar, and spread the shoulders back. The old man shrugged into the coat with a mumbled thanks. The tall trees in the orchard were bending under the stronger gusts, while the shorter starch-apples beneath them were shedding their fruit. Dancing lines of green leaves scuttered across the dirt road. It had been a very windy year, and everywhere there were dead branches. Drifts of dried-up leaves made the ground beneath the trees look like autumn. The two men set off again towards the farmhouse, clambering over another toppled oak. Ed reached down and pulled at a cluster of acorns.

"Like being a kid again—I used to ride my bike out to the farms near town and sneak through the fences. Scrumping we called it. Nearly ripe. Want one?"

"No thanks, not raw." The professor shook his head as he walked, gesturing to the orchards. "I hate to see this. The crop will be ruined. This is the third year with a bad harvest. If it goes on like this, there'll be famine. Background information, not for publication."

"Famine? Surely not." Ed pulled one of the acorns from the stem, shucked the soft, thin shell with a thumbnail and popped the sweet, slightly green kernel into his mouth. "If we have a crop failure, then there'll be imports. I mean, the Old World's still there. Last thing I heard they were still farming."

The professor stopped, opened his mouth to say something then closed it again. He started walking and looked cautiously around before he spoke again. Ed had to walk close, bending his head to pick up the whisper.

"This is not to go any further. You know I was at the Climate Change Committee last week? There is new data. The world is on the brink of starvation. Crop failure. It's the same everywhere. There's blight in the Far East, China has lost the entire chestnut harvest to storms, and there's frost damage to half the sago palms right across the tropics. We've lost millions of acres up north. The pine seed crop . . ." He stopped and gripped the younger man's arm. "Ed, it's happening. Climate change is here. It's killing the trees. It's not on its way any more, it's happening right now. We must change whatever it is we're doing or we'll starve in the dark!" His face was angry. "Change! Or else be made to change!"

Ed shook off his hand. "Now you sound like one of those CO_2 fanatics."

"They are right about one thing. The ice is coming. In one hundred years, we'll freeze."

"I've heard 'em, Prof. 'Change our use of CO_2 or die'. Madness. 'Rip up the entire history of agriculture and start again!' Mad!"

"They've got a point. And you sound like one of your 'Trees First' fanatics."

"Trees feed us. Pine nuts, acorns, apples, all the starch fruits. Sago starch. Protein from nuts, fats from olives and beech, vitamins from flowers, greens from a hundred types of soft-leaves. We live by this stuff. And what is there to replace the forests? Nothing! It's a pipedream, Prof, just a pipedream."

"That's why I've brought you here,

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Ed. I know you're influential with the Trees First people and I've seen the stuff you write. Okay, so you're on their side, but we've decided that you care enough about the truth to listen to us and you're a good enough reporter to want to tell the story. We'll show you the way forward. You can help us change their minds." The old man stumbled, too absorbed in staring into Ed's face to see the branches under his feet, and Ed reached out a steadying hand.

"Easy, Prof, no hurry. Take it easy. Yeah, I agree with a lot of what the Trees Firsters say, but there's no way I'd condone their violence." Ahead was a low white building fronted onto the road. "Not far now. I should have left you in the steamer and got someone to pick you up. I was forgetting . . ." He broke off, embarrassed.

"Forgetting how old I am?" The professor laughed. "That's why I'm in a hurry. Old men like to leave some mark on the world before they go. This . . ." He pointed towards the farmhouse. "This is how I'm going to do that.

Their host was a huge man, bearded, with an open shirt collar and a handshake like a woodcramp. He grinned sheepishly when the professor introduced him as the only real grower in the whole group.

"The rest of us are just scientists, measuring things. Jimmy is the farmer, the practical man."

"Spare my blushes, Prof. I'm as new to these new crops as anyone. Blocked in, are you? No sweat, we'll fire up a clearfeller and smash a way out for you. Our big rig can pick up a mature cluster-oak and throw it aside like a twig. Now, you ready to eat? We've got some pretty special stuff. The research people eat pretty well, even though we have to cook for ourselves. That's because of the security."

Ed shifted his satchel from one arm to the other.

"Security, Jim?"

"Yeah. Trees First have been threatening us, even here."

"Even here? I'm surprised they can get near. Or is that steel fence along the road just for show? And the gate guards?"

"We've got to take them seriously. They say we threaten mankind."

"And what do you say?"

"I say we're mankind's best and last hope. Anyway, we're just the research facility. We provide the evidence and show the way ahead to a desequestered world. It's politicians who'll decide." Jim shifted uneasily, rubbing one big hand across his head. "Sorry, I was told not to lecture. Anyway, let's eat first. We'll persuade you later."

"If I were you, I'd sack your guards. They just waved us through."

The farmer smiled.

"That's because we run on a personal level. They know the steamer, they know the driver. Just try driving up here by yourself sometime. Come and meet the team."

It was a small but select band that sat down at the big table in the kitchen. Ed recognized a couple of the faces from the newsreels. Most of the reports had been of attempted assassinations, firebombings, and unexpected boiler accidents, for this group, just ten men and women, were the most marked people on the planet. He recognized some of them: O'Donniel from the Old World, with fiery red hair and reputedly a temper to match; Ishmael the geneticist, the long scar from the assassin's knife livid on his cheek; the woman near the end who passed the plates out with trembling brown hands and whose name he could never recall—she'd been firebombed only a month ago. What the hell was her name, something from the Far East—Krashni? He looked at his plate as she slid it onto his woven placemat.

"What's this?" It looked like a 'corn patty, but it yielded springily to his fork.

"It's . . . No, try it first. Tell us what

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you think." She had a low husky voice.

The fibers . . . no, not fibers, something different. Like a soft sponge that melted in the mouth. "Not bad. What is it?"

"We call it 'bread.' It hasn't been made since prehistoric times. Professor Airmith worked it out from archaeological evidence in the eastern Old World. Jim found out how to grow the basic ingredient. Try it with some olive oil. They could have been made for each other."

Ed chewed reflectively and nodded to the big man at the head of the table.

"Not bad at all. Different, but not too different. Some sort of acorn? Or starch apple? Slightly yeasty."

"The yeast's the secret. That's what produces the texture, that and the long fibers the starch makes."

"A brand new tree species?"

"No. Seed. Grass seed."

Ed started to laugh, then stopped when he saw the faces staring at him intently.

"What? Like cavemen? Seeds from grass?"

Suddenly Jim laughed, and all the faces relaxed into grins and guffaws.

"Just joshing. Here, have a drink. This is new too."

Ed swigged the dark brew cautiously. Not bad, but like no cider he'd ever tasted. His joke, "So, this is from grass seed as well?" brought a general laugh. He enjoyed the rest of the meal; the curiously chewy burgers, the fleshy soft-leaves that made his guts rumble, the nutjuice that they had made into a smooth white drink like breastmilk. He asked for more of the drink they called "ale" and began to relax. Krashni—yes, he remembered now, that was her name—poured more ale as his flagon emptied.

"Do you eat this stuff every day?"

"Most days." The woman smiled conspiratorially. "Not tonight, though. It's my birthday and I've insisted we splash out on some real food. You're welcome to come. Real cider, too, not this ale stuff; I can't stand that. Seven or seven thirty."

"Thank you. I'll have to check with my office. If there's a story breaking, then I'll be pulled in." If the plan worked, he would need to be out of the country by then. The woman was very attractive. Ed stifled a pang of guilt about his mission. Trees first, he reminded himself, but the guilty feeling didn't go away. He downed some more ale. He had to hold firm. The future of the whole planet was in his hands. If these fools gained influence then civilization was doomed.

It took Ed an hour in the farmhouse to notice what was odd about the building: no wood had been used in its construction. It was all steel and stone. Even the window frames were of steel. Literally the only wood on show was the huge pile of logs smoldering in the enormous fireplace. And his flagon. He reached for it, feeling the wood bounce against his teeth as he misjudged the distance to his mouth.

"No wood. Clay plaster instead of paneling. You're making a point, is that it? 'No sequestered CO_2 in my house. Look at me burning wood and releasing trapped CO_2.' It's a bit . . . obvious, isn't it?" Ed's voice was mocking.

The farmer looked away, obviously too angry to speak. O'Donniel leaned forward over the table, his voice polite.

"Our civilization has covered the planet with trees and sequestered billions of tons of CO_2 in our orchards. We've watered the semi-desert lands and made them cool and moist so our trees will grow even there. That new soil has absorbed billions more tons. It doesn't give them back—that's not the way it worked before we interfered and things were in balance. Then there was an exchange as the poor soils were blown around and recycled in dry seasons. We've stripped the Far North of peat and buried it under our orchards, exposing paler rocks, which reflect the Sun's radiation back into space. Admit it, Ed,

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trees are killing the Earth."

"You could never feed everyone from seeds! Never in a thousand years!"

"But we nearly did, Ed. Five thousand years ago, someone in the Old World found one oak tree with acorns that were not stiff with tannins. The Trees First people have forgotten that acorns, wild acorns, are almost inedible. From that one tree, one sweet oak—we have the archaeology, Ed, it is incontrovertible—from that one tree our whole civilization was born. One tree, from which we bred cluster oaks, spike oaks, every variety that makes our staple. Other peoples learned the trick from us and found their own tree-crops. Pine nuts used to be tiny, not a great lump as big as your thumb. Chestnuts were smaller than apples. Starch is the key: good, solid, stick-to-your-ribs starch. Before trees took over as our starch supply, there was a whole swathe of cities in the eastern Old World that lived on grass seed. One tree was all it took to change the world. But now the trees are killing us, sucking away the blanket that keeps us warm. We need to release that CO_2. It's nearly too late."

"But feed the world from seeds? It's impractical!"

O'Donniel gave a reluctant grin.

"Oh, I will concede that. I'm not totally unrealistic. We can substitute some of the trees at least. Just a few percent will help. Ten, maybe twenty percent in the not too distant future. It may be enough."

"I'm not convinced. Yes, the climate's changing, but no one's proved it's not a natural phenomenon. And anyway, it's too late to change. We can't put the clock back, even if we wanted to."

The quick babble of protest from the whole group was cut off by the farmer holding up his hand.

"Come on, Ed, let's show you around the orchard. A couple more ales and you'll be in no state to appreciate what we're doing here." Jim gave him a helping hand from his chair and Ed, lurching a little, followed him out of the back door of the farmhouse onto the southern slopes of the farm, past the prefabricated wooden huts of the laboratory proper. It was dark beneath the trees as they followed the track downhill. Then they were out into bright sunlight, the gale buffeting them. Ed looked around, startled. Out of the trees! For nearly a mile, the slope was bare, not a single trunk breaking the flat, rolling acres. The land was yellow, with tall grass stems by the million tossing in the wind, bending and rising in a hypnotic sway. Large areas lay flat, beaten down by the wind. To his right was a compound with rusty steel posts and wires holding back small brown animals, which he recognized from zoo visits.

"Orchard? This isn't an orchard. It's a . . . a desert. And those things. Goats! I've seen 'em in the zoo. They eat trees." He looked up at the big farmer. "Stands to reason, you can't run an orchard and keep goats. What're they for?"

"You know the nutjuice? It wasn't nutjuice. See between their back legs? Well, what you do is . . ." He explained the milking process in detail while Ed turned green.

"No. Don't tell me any more. Enough, I feel sick."

"There's more. You know the nutburger? Well, what you do is . . ." He got as far as butchering before Ed ran away into the tall grass, hand to his mouth.

It took the clearfeller only a couple of minutes to smash a way through to the main road. Once they got up to speed, the steamer's feedhose humming, Ed and the professor sat in silence for most of the way back to town, the old man busy with his driving, Ed with his thoughts. With a couple of miles to go to the university, Ed suddenly spoke.

"I've been thinking. Okay, I'll allow that your grass seeds could feed people. They might even enjoy the diet once they got over the revulsion of eating ani-

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mals for protein—I mean, that squirrel cutlet was pretty tasty. But trees give us so much more. Steamers, for example. How would we run them without wood? What about houses? Pavements? Charcoal for smelting?"

"Steamers are easy. You can burn seeds. It's not as good, as wood but it's okay, like running on olive oil in an emergency—easier, actually, because you're dealing with a solid, like wood chips. It works, but it's wasteful. We'll find something else, something obvious we haven't thought of. For the rest, well, you've seen the farmhouse. We don't need wood, Ed, we're just used to it being available." They drew up beside Ed's steamer in the parking lot. "I'm sorry that didn't go as well as it might. What about it, Ed? Can we rely on you giving us a decent hearing? Will you write something that'll give our side of the story?"

"You've certainly given me something to get my teeth into. Yes, I think you'll see yourself in a big spread tomorrow." Ed turned away to hide his smile, suddenly grimly amused at what he had just said. "Oh, yes. You might even make the front page."

"That's good to hear."

"Have you thought about the long-term effects on society? Your seeds get planted in spring and eaten in the same autumn. Plant an orchard and it doesn't even start to yield for five years and it's good for fifty or a hundred. If everyone goes over to your short-term crops, then we'll look at the world in a different way. We'll live for us, not for our children. Consume everything now, not plan for the future."

"That's not how it's worked out with our research team. Seems to me that the future of the entire planet is a pretty good long-term concern. Back then, when it first started, that might have been true. No civilization could ever have got off the ground with a short-term mindset—but we know better. We've had generations of thinking about the future."

Ed got out and began to walk away when he heard a shout from behind.

"Where's your satchel?"

"I must have left it in the field," he shouted back. "Can you pick it up tonight? Let me know if it turns up." His voice dropped to a whisper as he opened the door of his steamer and climbed up the steps. "Or maybe I left it hidden by the dining table where they all meet at seven thirty. Where it'll do most good." He hummed a little as he fired the boiler, then jumped when the old man suddenly spoke next to his ear, panting a little. He must have run to get in the last word. Lucky he hadn't had a heart attack.

"This matters, Ed. It really, really matters. Those seeds of James' mean we can chop down the orchards, release the CO_2. Their work shows us how to save the planet. Imagine it! Fields of seeds, for miles and miles. No trees! A warmer world, crops we can manipulate at will to work with Nature, not against it. It'll be paradise, Ed, paradise on earth. Please think hard about what you write."

"I'll think about it, Prof, don't worry."

Ed waited until he was back on the open road before he began to laugh. Grass seeds! *Grass seeds*! Paradise! He laughed so hard he nearly ran off the road. ■

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Why Do Readers Always Ask?

James P. Hogan

Okay, admit it: you've asked it too. . . .

When writers who attend science-fiction conventions get together—typically in a bar—a question that I've noticed often comes up in conversation is: "What questions do you hate being asked most on panels?" In fact, I've sometimes proposed just that as a subject for a panel. One that ranks high on a surprising number of people's lists is, "Where do you get your ideas from?" It does on mine too. I'm not sure that I've ever heard anyone give a tidy, rationally packaged explanation of why. But, in the probably forlorn hope that by addressing the issue here I might reduce the number of questioners who pose it in the future, here are a few thoughts. And since the topic is evidently of interest to many regardless, I'll offer a few examples—as far as I am able to reconstruct them—of how the first stirrings began that led eventually to the feeling that "there's a book here!" in the case of some of my own earlier works.

I'm not convinced that the human mind ever comes up with anything that is truly original—a genuine creation out of nothing of something that didn't exist before. (Try imagining a new color, for example.) Rather, what we call "innovation" is more a process of recombining elements from our experience in novel ways. In other words, all that is truly new comes from the world outside. What gets the wheels that generate ideas turning, therefore, isn't sitting around in idyllic settings waiting for "inspiration" to strike, but getting out and about to where the stimulation and variety is that the real world has to offer. Don't avoid people. Learn to talk to anyone, from denizens of sleazy bars to Nobel laureates and corporate CEOs. And even more important, listen. They all have thoughts and experiences that can throw a new light on life from a hundred new angles that you never even knew existed. It's in-

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teresting how often believable characters turn out, on closer examination, to be patchworks of people we've known. Never turn down an opportunity to travel. Read anything—especially things that you don't "normally" read, until the word no longer really means very much. Cultivate the art of curiosity to the point of addiction.

The result tends to be that when somebody asks where you get your ideas from, it's almost impossible to answer. There is no pattern or logic to it. They can come out of anywhere, from the most unexpected sources in the most unlikely places, at any time. The honest answer is that you make the effort to observe, to listen, to read, to ask questions, and to think about it all. But the question has the feel of negating all the work and effort by implying some kind of "trick" that makes it easy for the in-group who are privy to it. Maybe that's why so many writers take umbrage at being asked it. A standard answer, delivered straight-faced, is that there's a subscription service in Chicago they belong to that sends them three new ideas every month.

The first book I wrote was *Inherit the Stars* (1977), which dealt with the discovery on the Moon of a fully human, space-suited corpse that had been there for 50,000 years. Logically there are only two possibilities: (1) he's from Earth; (2) he isn't. (1) implies the existence of a vanished Terran civilization sufficiently advanced technically to get him to the Moon. (2) implies an alien biology that produced a form indistinguishable from human. Neither alternative is acceptable. Therefore no such corpse can exist. But it's lying right there on the slab. So we get a scientific detective story in which, starting with just a corpse, its space-suit and back pack, and a few other articles that it was carrying—plus some other items discovered later—the investigators manage to put together an surprisingly complete picture of the world that "Charlie" came from. The problem is that half the evidence says he must have come from Earth, while the other half says he couldn't have. How it gets resolved, I shall leave insouciantly to tantalize those who haven't read the book yet.

The idea in this case started out as a touch of disgruntlement over the movie *2001*. I loved the technical authenticity, the space station orbiting to a Strauss waltz, the feeling of realism that came from seeing the station's Hilton Hotel logo, Pan Am's on the docking shuttle, and IBM's on the pilot's console. This could have been the world my children would grow up in. And what could be more intriguing than the notion of a discovery being made in the course of lunar exploration, sufficiently exciting to mobilize a sizeable proportion of the scientific community? But I didn't understand the ending. After setting me up on the edge of my seat for a resolution that would tie everything together, it collapsed into surrealism and symbolism about old men dropping wine glasses and babies in bubbles that left me mystified. Back at the office the next morning, I was still complaining. Probably to shut me up, somebody told me that if I thought I could write something that made more sense, then go do it; I said I would, and the whole thing ended up as an office bet for five pounds a head (I was with DEC in England then) that I couldn't write a science fiction novel and get it published.

So why a corpse? Well, I wanted to depict science as a great, ongoing mystery story, which is how I see it. Mystery stories have dead bodies. But if we're going to get a good portion of the scientific community excited, there had better be something more interesting about it than footprints in flowerbeds and a handkerchief in the library. So we made it 50,000 years old. You see my point from above—a lunar setting; a view of science; a set formula for a murder mystery. Nothing really new. Just familiar elements put together in a different way. Anyway, the upshot was that it found its way to Judy-Lynn Del Rey of Ballantine

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Books (to show how green to the business I was, I had never heard of either) via a DEC large-system software support specialist in Maynard, Massachusetts called Ashley Grayson, to whom I will be forever grateful, now a literary agent in California. Judy-Lynn liked it, offered a contract, and I made fifty pounds on top of the publisher's advance.

The follow-up came a couple of years later, after I had moved to the U.S. to manage part of DEC's sales training program, and was having dinner one night with Arthur Clarke, Judy-Lynn, and Lester Del Rey in Boston. I had told many people the story of how *I the S* came to be written, and heard many interpretations of what the ending to *2001* meant. The trouble was, they all contradicted each other. I had read the book and remained none the wiser. Now, finally, I could put it to the ultimate source.

"Arthur," I said, "What did the ending to that movie mean?"

I can remember his answer word for word. It was, "I haven't the faintest idea." I was stunned. It was like making a pilgrimage to Rome for an audience with the Pope, only to be told in a whisper behind the hand, "I don't really buy all this, you know. I only do it for the dressing-up and the parades."

Apparently, the movie was based on Arthur's short story "Sentinel." As he told it, Stanley Kubrick wanted to end it one way; another Hollywood person wanted to end it another. Arthur explained, "They ended up waving their arms and shouting. I walked away and left them to it, and that was what they came up with. I've never really understood it either." I confessed that I had shamelessly stolen the gist of his storyline. He replied, "I know. I've read it. And your ending is better." Then he added with a chuckle, "But mine made more money."

My work as a computer sales engineer specializing in instrumentation and control systems, first with ITT and Honeywell, later with DEC, involved dealing with scientists and engineers from just about every field. I used a number of them as consultants for *Inherit the Stars* and the books that followed, before I left the world of corporate employment to write full-time. One of the nice things about the world is that seemingly everybody loves to help an author write a book. *The Genesis Machine* was intended for physicists who said things like, "Oh, I used to read science fiction when I was younger, but I went off it when the science got to be too silly." (It was my second book, and I was still too green to realize that one reason for writing books was to sell them.) But as things turned out, it drew enthusiastic responses from a wide spectrum of readers.

The story is built around extrapolations of particle physics described in a defense-oriented research setting, where in developing super-weaponry, scientists stumble on the physics that will make the "hyperspace" drive—or whatever you want to call it—of science fiction a reality. Two elements came together in this instance to yield what became the book. One was a used book that I'd picked up in a London street market as a teenager many years before, which developed a theory of matter decaying at an imperceptible rate, with gravity generated as a consequence. The other element was a thought that I had been entertaining about how all those s.f. stories that had spacecraft being sent across light-years of space, only to launch a pretty conventional bomb or missile at a target when they got there, seemed to miss the very point that they themselves made. I mean, what does a bomb do? Concentrate energy on a target. Well, if you can send the ship, why not just send the energy? Transporting a bomb seemed a bit like inventing gunpowder to blow holes in castle walls, and then trundling a barrel of it up to the wall in a cart instead of inventing a cannon too, while you were at it.

As often happens, the two thoughts coexisted for years in separate brain

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compartments without it occurring that the implications of one might answer the question posed by the other. Developing the revolutionary physics could form the basis of a weapon system worthy of being called futuristic. Fine, but hardly a blockbuster of an idea. But then add the twist that developing the weapon unexpectedly leads to the discovery of "hyperspace," and *voila*: the basics of a plot.

The Gentle Giants of Ganymede was written in parallel with *The Genesis Machine*—discerning readers may have noticed that they were released one month apart. This was before the days of e-mail, and I was in that early phase where a writer needs a lot of input and handholding from the editor. So while I was waiting (still in the UK) for responses to the last letter regarding one book to complete the two-to-three- week round-trip from New York, I would push the manuscript aside and turn to the other. As the sequel to *Inherit the Stars*, *Gentle Giants* originated not so much through any new inspiration as from the growing realization while I was writing the first book that there could be a lot more to this story yet. It turned out to be more than I realized even then. The "Giants" series is now up to five books.

Sometimes a new story comes about by looking at a well-worn idea from a different angle. Time travel and artificial intelligence stories were hardly original concepts by the early '80s, but it seemed that every new science-fiction writer had to "do" one of each—a kind of rite of passage to being established in the genre. Were there any new approaches left?

In the case of time-travel, once again two separate thoughts came together. First was a desire to get away from the practically universal depiction of a "time machine" as some kind of conjuror's box that you got into, out of again in some other age, and on with the story—a vehicle to convey characters to the required setting. For a start, I certainly wouldn't climb into something like that, untested and unproven, with no guarantee that it will bring me back again, even if it does what it's supposed to do in the first place. I'd want to try it out through some trials with other objects and a few lab rats first. So there was an air of unreality that felt dissatisfying—I suppose, a bit like the ending to *2001*.

And then, in a way similar to that for *The Genesis Machine*, it seemed to me that sending a burst of energy through time might be a more believable step as a prelude to sending structured objects. If you can send energy, you can modulate it, which means being able to transmit information. Hence emerged the idea of a story not about sending objects through time in conjurors' boxes, but about discovering means of communicating: a time "telephone" or computer hookup. It opened up all kinds of possibilities for amusing story twists—imagine a message popping up on your screen from yourself twenty years in the future—and, of course, it involved the same causal paradoxes as physical time travel.

The business of the paradoxes was the other thing that I wanted to address. Although it has to be the most challenging aspect of this kind of story, none of the ones I had read really resolved the issue. They had things like the "laws of the universe" not allowing contradictions; or characters being seized by mysterious compulsions to do what the plot resolution required; or characters meticulously arranging things the way they had been so as not to "disturb the past"—which they had disturbed anyway simply by being there; or perhaps events would be set far enough back in the past for the paradoxes to be obscured. All these devices struck me as cop-outs. I wanted to know what happened when characters *didn't* put things back the way they found them. Nobody, as far as I knew, had ever faced up to the paradoxes squarely and dealt with them.

I put this to the late Dr. Robert Forward, s.f. writer and research scientist

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with Hughes Aircraft, when I was attending a science-fiction convention in Los Angeles, round about 1979. Bob didn't think there could be an answer that dealt honestly with the paradoxes. I wouldn't accept that, and we ended up back at his home in the San Fernando Valley going through several bottles of wine and one of scotch in an all-night session of drawing up diagrams and charts, which by the time the Sun came up, covered a fair part of the walls of his living room. He concurred at the end of it all, "Okay, I think it could work."

What we did was reduce the situation to the simplest configuration imaginable: a button and a light. When you press the button, the light comes on. The only complication was that they were connected via a box that time-shifts the signal. The light comes on thirty seconds before the button is pushed. The paradox is then obvious, immediate, and unavoidable: the light comes on and thirty seconds later it's time to press the button; but being of normal human perversity and curiosity, I don't press it. What happens? And conversely: the light didn't come on thirty seconds ago, but I press the button anyway. What happens?

Every time-travel paradox is one or the other of these two situations in some kind of disguise. So when you can answer both the above questions, you can deal with any paradox. Three-hundred-or-so pages of people pressing buttons and observing lights would quickly degenerate to pretty dull reading, however, so we now reinvest the various combinations of button-and-light dynamics with the disguises to form a story. The result was *Thrice Upon a Time*, published in 1980.

The treatments of AI that I had come across all seemed to revolve around a large central system or network of some kind becoming complex enough for intelligence and awareness to "emerge." Then in the ensuing interactions with the world of humans that follow in order to make a story, it's posited that such human percepts and concerns as survival, fear, competition, and domination are as meaningful to the machine as they are to people. Neither of these tenets struck me as being very believable. So in the offering that I came up with as a contribution to the literature of AI themes, *The Two Faces of Tomorrow*, in what I hoped would be sufficiently far ahead in the future for AI- capable technology to seem feasible, the system was designed by some of the best people in the business to be what it was, and it tried to defend itself against threats to its functional integrity because it had been programmed to do so.

The object was to find out just how far such a system could go in protecting itself, precisely because some experts were worried that the global computer complex that the world had come to depend on might start to militate against human interests—not from any sharing of human traits but coincidentally, having no concept of humans or their interests. In other words, was there a danger of it pitting itself against us inadvertently, precisely because it doesn't understand anything about us? The purpose of the experiment is to find out. The fun starts, of course, when the system turns out to be capable of far more than anyone had bargained for. Just as well they conducted the experiment in a society-in-miniature contained in a specially adapted space colony, well away from the real world.

Thrice Upon A Time didn't quite get the time-travel bug out of my system. The thought of an alternate history treatment of World War II had been in my mind for a long time, but when, in my still-greenish enthusiasm, I proposed it to editors, I learned that what-if-it-had-gone-the-other-way? notions in the form of England under the Third Reich, the Japanese victorious in America, and so on were hardly new. Again, it seemed that if I wanted to go anywhere with it, a new angle was called for. So, I tried looking at it the other way around by having

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the war being lost by the Allies as the way things were *to begin with*. Our meddlers-in-time go back to change that outcome, and as the story develops we see the history that we know coming together out of it. This was *The Proteus Operation*.

It was also my introduction to one of the pitfalls that can result from the insatiable curiosity that goes into making writers. I got so enthralled in researching the 1930s politics that led up to the war, the history of the Manhattan Project, and backgrounds of such people as Einstein, Teller, Szilard, Fermi, Churchill, Roosevelt, and others that I made characters in the book that over six months elapsed between my finishing the Prologue and commencing Chapter One. Much of the story was set in New York in 1939, giving Isaac Asimov a walk-on part, which he loved. The flash of insight that enables Einstein to solve the key problem occurs when he comes across on of Isaac's stories discarded in a trash bin.

Voyage From Yesteryear dealt with the colonization of a world by descendants from a founding generation who had been raised by machines from human embryos created to genetic information stored electronically. Hence, we have a society that has inherited none of the social conditioning processes traditionally imposed on the young by conditioned adults. The story describes its reaction when a mission from Earth finally shows up and tries to reclaim "Earth's" colony and instigate forms of authority that the inhabitants have never been taught to respond to.

The idea had its roots years before, in a pub in England, when some friends I was with asked, "What's the answer to the problem in Northern Ireland?" I replied that there wasn't one. After thinking more about it for a while, I added, "Unless you separate the children from the adults for at least a generation." That led to the questions: If you did, what sort of a society might result? How might such a situation come about? And the rest followed. In fairness, I should also add that the general tone of the book took some of its inspiration from a delightful short story that I had came across long before, entitled "And Then There Were None" by Eric Frank Russell (1951).

Voyage was also seen by some as a kind of updated Gandhiesque guide on how to undermine an authoritarian regime when they've got the guns. It was serialized in a Polish s.f. magazine called *Fantastyka* in the mid '80s, and found its way, I'm told, into several Eastern European countries and Russia. A couple of years later, they were all doing it. So never mind these things you hear about the Soviet system coming apart because of the bankruptcy of the communist economy, their getting into the Western computer networks, or the threat of Ronald Reagan's "Star Wars" program. *I* claim the credit!

After it was all over, I was in Poland as a guest of the Eurocon convention held in the old medieval capital of Krakow, and had lunch in Warsaw with the people who produced that original serialization. Since there was no foreign currency exchange mechanism available at the time they published it, they had put some zlotys aside for me in a Polish bank. But after two years of ruinous inflation, coupled with the determination of the outgoing regime to sabotage everything to prove that the new system wouldn't work, the amount yielded the princely equivalent of $8.43. So, after all the billions that the U.S. spent on ICBMs, SAC, the CIA, NSA, the nuclear Navy, and all the rest of it, that was my price for bringing down the Soviet empire.

Now, wouldn't it be interesting if, years from now, somebody were to interview the aging veterans from the days of the Berlin Wall, defiant Polish labor unions, and students facing down tanks in Moscow, and ask them, "Tell me, where did you get your ideas from?" ■

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LENGTH CONTRACTION

Now that it's 2006 and the Einstein Centennial year is behind us, along with any number of popular articles implying that Einstein was right about everything, perhaps it's time to go about clearing up some confusions about just how it is that Einstein's Universe really works. For as it turns out, and has been long known by physicists (just not by that many), some of those things "everyone knows" about what relativity says "just ain't so." And in this column, I'm going to get set things straight about relativistic length contraction.

When I was growing up, the popular books on Einstein's special relativity (SR) theory said quite clearly that when objects move, time slows down and the object gets shorter (and mass increases, but I'm not going there at all this column). They said that when an object, like a spaceship, is moving at a very high percentage of the speed of light, then the "time dilation" becomes pronounced and it's possible to go to a star 20 light years distant and yet only age a few years. And they said that if someone was looking at your spaceship while it was crowding lightspeed, they'd see it contracted in the direction of travel, so that a 1000-meter long spaceship might look like it's only 100 meters long.

We'll leave the facts (such as they are) about time dilation to another column, but in the case of length contraction, it is not at all the case that the spaceship will necessarily look contracted. In fact, if the spaceship is coming toward you, it will look longer, and if it's going away from you, it will look much shorter than the relativistic length contraction suggests it should. And the fact of the matter is that this reality was known certainly by 1960, since it was published in the *American Journal of Physics* then, and the findings have never been in dispute.

Indeed, let's see what a couple of modern books have to say about this matter.

One of them is an educated layman's book called *Simply Einstein: Relativity Demystified* by Richard Wolfson (1). Ironically, given the title, Wolfson has very little to say about the issue, just a few paragraphs worth. But a couple of sentences from pages 116-7 go like this: "However, that doesn't mean you *see* the object contracted." And: "Remarkably, the object *appears* not contracted but rotated!" (Italics in original.)

The other is a graduate level well-respected textbook called *Classical Electrodynamics* (3rd Ed.) by John David Jackson, one of the most respected references in the field of E&M (2). Jackson has nothing to say about the subject except in the suggested reading section of chapter 11, the chapter on special relativity. On page 567 it reads: "Another neglected subject is the appearance of rapidly moving objects. This fascinating topic illustrates how careful one must be with concepts such as the FitzGerald-Lorentz contraction." He then lists five journal references on the subject.

An exceptionally straightforward account of what you can expect to see

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when observing a moving object is "Observation of Length by a Single Observer," by Roy Weinstein (3). (Note: Jackson neglected to mention this one, but to me it looks like it is the most accessible to the educated layman, and it is the one from 1960 that I mentioned above.) Weinstein does a good job of describing how Einstein's measurement method requires *two* observers with synchronized clocks, one noting the position of the front, and the other the position of the back of say a moving rod, at the same time. (As it turns out, it isn't even possible for anyone to actually *do* this measurement.) The difference between the position of the front and back is then found, and this is defined to be the length of the moving rod.

Weinstein says (p. 608 of ref. 3): "As a result of (the usual length contraction equation), educators from Einstein to Gamow have concluded that an observer sees the rapidly moving rod contracted. *An* observer *seeing* the meter stick, however, are words describing a particular experiment, and it is easily seen that the experiment consisting of a single observer viewing a rod is not the experiment described by the Lorentz-Fitzgerald contraction." (No, I didn't screw up earlier—Jackson uses "Fitzgerald-Lorentz.")

Weinstein demonstrates that what you actually *see* depends upon how fast the rod is moving and whether or not it is approaching or receding from you. In the former case, you see the front of the rod at one time and the back of the rod from a time *earlier* than that because of the light speed delay, so the rod looks longer. In the latter case, you are seeing the front of the rod from an earlier time, but since it's now moving away, earlier means it is closer to you, so the rod looks shorter.

You may have heard that fast moving objects look rotated, but this is only somewhat true for objects sufficiently far away—if you're within five feet of a passing ten-foot rod, there's no way it can look rotated.

Bear in mind that how the object looks is almost entirely a classical effect, due simply to the finite speed of light. Weinstein says that the only time a single observer can see the Lorentz-contracted length of the rod is when he's at right angles to it. But if this is true, why do we need two observers? Can't we just have one observer taking his measurements when the rod is dead center? Of course, judging when the rod is "dead center" isn't going to be easy, since the receding front will look closer to you than the approaching back even when you're "really at" the midpoint. Even with two observers, for each to be exactly orthogonal to the respective front or back of the rod when the measurements are made, they'd have to know ahead of time what the measurement was going to be so they could position themselves accordingly. Absent that knowledge—well, you'd need an infinite number of observers with an infinite number of synchronized clocks to get the measurement right, although the observers wouldn't be able to agree on what the answer is.

Still, Weinstein claims that an observer will see the expected contracted length of the rod when he's orthogonal to the midpoint of the rod as it's passing. However, he doesn't derive this—he just adds it in to the classical effects.

The real question is, does length contraction happen at all?

The best discussion I know of which is devoted specifically to the topic is in Oleg D. Jefimenko's *Electromagnetic Retardation and Theory of Relativity* (4) where he specifically says that length contraction doesn't happen. (He also lists for further reading most of the same references that Jackson does, and a few later ones—even in Jackson's 3rd Ed. his refs only go to 1970 or so. By the way, "Jefimenko's Equations" are discussed in Jackson.) In the book, Jefimenko derives all of the equations of relativistic electrodynamics just by using retardation ("re-

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tardation" is the technical term for explicitly taking into account the light speed limitation of electromagnetic interactions). That is to say, SR is a short cut—albeit a valid short cut in most (but not *all*) cases. Retardation is more fundamental than SR, requiring no postulates and simply the experimental fact of c-speed EM interactions. (I gave Jefimenko's book a short review in my April 2003 column. It's a bit math heavy for the average Joe, but Jefimenko does all the derivations in full using just vector calculus with retarded quantities, so the discussion is about as transparent as it can get mathematically.)

The first sentence of chapter 9 reads: "There is a wide-spread belief that according to relativity theory the length of a body becomes shorter when the body moves. This is incorrect." By way of proof, in earlier chapters Jefimenko calculates for a line of charge moving in the direction of its length (i.e., the rod is charged), the resultant electric forces measured (experienced) in the rest frame. The motion makes it seem *longer* than it really is if it's moving toward you. This is in accord with what Weinstein says happens visually. But in chapter 9 Jefimenko shows that if you try to calculate the correct expression for the field of a moving line charge, putting in the Lorentz-contracted length, which Weinstein does in his paper for the visual appearance, leads to the wrong result.

Cutting to the chase, we have this from pg. 209: "Taking into account that in chapters 6 and 7 we obtained correct relativistic transformation equations on the basis of the *retarded* length and volume of moving charge distributions, taking into account that Lorentz contraction requires not one but two observers (two points of observation) for its exact manifestation, and taking into account that electromagnetic fields and light propagate with the same speed, we have hardly any choice but to conclude that the relativistically correct visual shape of a moving body is its retarded shape. We then also have a clear answer to why the retarded field theory, without using Lorentz contraction for determining the effective shape of a moving charge, yields relativistically correct fields of the charge. The answer is very simple: as a physical phenomenon the relativistic (kinematic) Lorentz contraction does not exist. And the fact that the several revisions of this concept had no ill effect on relativistic electrodynamics or on any other branch of physics is an excellent indication that the concept does not represent a physical phenomenon in the conventional sense."

For those of you grinding your teeth right now, what's worth knowing at this point is that Jefimenko is by no means an "anti-relativist." He is not at all arguing that relativity is wrong—he is arguing that the correct application of the relativistic transformation equations to the problem of moving line charges (and moving rods) does not support the idea of real shrinkage. He even shows how several so-called "contradictions" in SR, used by some anti-relativists to discard relativity as wrong, are not contradictions at all, but rather a misapplication of the "coordinate transformation machinery."

Never one to shrink from a controversy, I agree with Jefimenko's analysis. To disagree with him I'd have to refute some rather straightforward math. But there is nothing wrong with the math (the guy has equations named after him, for Pete's sake). Also, the rigorous employment of retardation to electrodynamics is a more fundamental way of doing physics than are the postulates of relativity. And as the book shows, retardation predicts the same tested and accepted results for experiments that relativity does.

In that light, it is simply *unscientific* to continue to think that length contraction is "real" in the sense we were all taught.

The author would like to thank for

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their inspiration those persons at the Analog *forum who were discussing relativity theory around the time this column was coming due.*

References

1. Wolfson, Richard, *Simply Einstein: Relativity Demystified*, W. W. Norton & Company, 2003. ISBN 0-393-05154-4

2. Jackson, John David, *Classical Electrodynamics*, 3rd Ed., Wiley, 1999. ISBN 0-471-30932-X

3. Weinstein, Roy, "Observation of Length by a Single Observer," *American Journal of Physics*, Vol. 28, No.7, Oct. 1960, pp. 607-610.

4. Jefimenko, Oleg D., *Electromagnetic Retardation and Theory of Relativity*, Electret Scientific Co, 1997. ISBN 0-917406-21-4 ■

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"The Night Is Fine," the Walrus Said

John Barnes

Debates over "Who is human?" started long ago—and we can expect them to get *much* more complicated!

"A loaf of bread," the Walrus said,
"Is what we chiefly need:
Pepper and vinegar besides
Are very good indeed—
Now if you're ready, Oysters dear,
We can begin to feed."

"But not on us!" the Oysters cried,
Turning a little blue,
"After such kindness, that would be
A dismal thing to do!"
"The night is fine," the Walrus said
"Do you admire the view?"
—Lewis Carroll,
Through the Looking Glass

Many of us never really recover from having been seventeen. I'm sure I didn't. The day after Paxa Prytanis found out she was UT, which put an end to our twelve-stanyear relationship overnight, I slept late, ate vast amounts of sugary food, put on all of the recordings I had ever made of my saddest songs, and sat and cried, in between occasionally wasting some very good Hedon Gore on getting drunk by myself. I listened to my own clear sweet young voice sing "Canso de Fis de Jovent" over and over, mourning my lost youth, extraordinarily silly in a toszet who had just celebrated his fiftieth birthday.

More silly in an artist who had performed on more than twenty worlds. Sillier still in an OSP agent who had killed in the line of duty and had friends die beside him. Though you could argue that being UT is a kind of living death; since it's the catchall category for "peo-

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ple we still don't know how to get back off a psypyx, so they stay in storage instead of coming back in a clone body." In effect, that last five percent of the population for whom, after all the progress of the last three decades, death was still permanent.

Paxa had wisely decided that a job that involved getting shot at was a poor career choice for a UT, and perceptively decided that I would never happily leave that job myself, and so, after twelve stanyears as partners, lovers, comrades, and leaders of the best team in the OSP, she was gone and I was alone.

I savored that word "alone" and had a bit more Hedon Gore—it was Hedon, just like Paxa, and red as blood just like . . . well, there had certainly been some bloody events in my life before . . . I could work that in somewhere, I was sure, maybe into a song when I was feeling a little better . . . might be a great song . . . the wine was superb, Hedon like Paxa, and the song would be superb, Occitan like me, and the wine and the song would go well with a large hunk of pain au chocolat, after all I was in shape and a day or two of overindulgence never hurt anyone.

I was about halfway through the crusty bread and deep rich chocolate, and deciding that the wine ought to be balanced with some nice strong coffee, when the com chimed. "Put it up on voice-no-vid," I said.

"Yes, sir." My personal aintellect had a slightly obsequious tone in its voice, the product of my years of abusing it—something that Paxa had made me promise, on her way out the door, not to do anymore.

"Thank you," I said. "You're a good aintellect."

"No, I'm not," Raimbaut said, appearing on the screen, his smooth teenager's face incongruous as it always was.

"I was talking to my aintellect," I said.

Raimbaut made a strange face, probably thinking I was cracking up completely, but he'd known Paxa almost as long as I had, so he said, "I see part of Paxa *is* still with you, *companhon*. Margaret broke the news to Laprada and me. What rotten luck for Paxa; we sent her a note to tell her we wish she'd stay in touch with us, but we know why she won't. So now we have another friend to take care of. Are you drunk or just getting there?"

"There and past."

"Good. You can take a scrubber now or wait for us to get there. Are you naked?"

"Sweater and gi pants," I said. "As much as I cared to put on today."

"Then we're coming through your springer right now."

There was a high pitched whistle from upstairs, then Laprada's loud "All right, where is the horrible old monster of ego, and do we shoot him now or wait till he's done something?" and Raimbaut trying not to laugh because as my old friend he felt like he had to protect me from Laprada's teasing at a time when I was upset.

Actually it was probably the best thing in the world for me, but that's how it is with old best friends; the things you don't understand about each other become keys to the friendship.

They bounded down the stairs, driven by the energy that came with their new bodies. Both of them had re-started from psypyx some years ago, so they were both physically seventeen, although Raimbaut had been a classmate of mine and Laprada was born fifteen years later, and they had died more than a decade apart. In another century, we often said, physical ages will be like shoes; you'll barely notice which ones someone is wearing today, unless it's brand new and unusual.

They were both in bathing suits, which was disconcerting since it was now almost midnight. "Where were you?"

"Over on the east coast. We were going to do an early morning swim and a picnic," Raimbaut said. "But Margaret

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called to say she was still worried about you and she didn't think she should look in on you twice, in two days, that that might bother you."

"It might," I admitted. When your ex-wife is also your section head, the life of an agent can get a little emotionally messy.

"Now," Raimbaut said, "Take the scrubber that you didn't take because you were mad at me. Then take a hot shower. We'll use your bedroom springer to get robes and pants or something. Come out of the shower dressed and as close to functional as you're ever likely to get. Move it."

He said it warmly and gently and it was as close to giving me an order as my old friend would ever come. I used the injector to put the scrubber right into my bloodstream, got into the shower, and by the time I came out, the two of them were waiting for me, with Dad, the other remaining member of the team.

I don't know why it was different, but although I sometimes caught myself thinking of Raimbaut and Laprada as teenagers when in fact they each had more than thirty-five stanyears of life experience, I could always remember that Dad was my father, and past eighty, though he was now in an eight-year-old body. Maybe it was that he was working so hard not to look disapprovingly at all the pastry wrappers and empty wine bottles that still littered the room because I had told the valet I liked them and not to clean them up.

"Robot valet," I said, loudly.

"Yes, sir?" It rolled out, shiny bulb of metal on treads.

"I no longer like the empty food and drink containers scattered around here. Return to your accustomed routine for removing them."

"Yes, sir."

"Thank you. You're a good robot."

"Thank you, sir."

They stared at me again and I realized that I had really established a reputation as a human supremacist, probably because of all my clashes with Paxa. "I made a promise to Paxa on her way out the door," I said. "*Gratz* demands that I keep it. These are going to be the best-treated robots and aintellects in human space."

"*Known* human space," Raimbaut said. He sounded grim, or as grim as a handsome teenage boy in a beach robe can sound. "Aintellect, see if Margaret is ready for conference?"

"She is—begin?"

"Begin."

My living room wall lighted up with the image of my ex-wife, thirty-seven light years away on Earth, but thanks to springer laserlink, closer communicationally than shouting from the bedroom. It occurred to me that in Dad's day, before springers, ex-wives had not been quite so readily available, whether in demand or not.

"Well, let's start," she said, a lengthy opening speech for a Caledon with business to do. "First off, Giraut, I want you to continue to work with the Ix Cycle, or at least let people think you are. It seems to really get the bad guys' attention."

There had been four attempts to kill me in two stanyears, by an unknown group that always sent very inept cancer-ridden teenagers to do the job; then there had been three attempts in a single night, the night of my birthday, when I debuted the Ix Cycle.

"Maybe there's a bonus if they get me before I turn fifty-one," I said.

My ex-wife made a face. "Macabre and maybe not funny. Of course I'm just guessing that it has something to do with Ixism, and it's obvious that the Ix-ists aren't doing it. And there's a subtle set of maybe-clues—Laprada was the one who noticed—that suggest links between the assassins and the extremist anti-Ix terrorists."

It is not particularly easy to be one of the few surviving witnesses to the founding of a religion, when you are not

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one of its believers. Margaret, Paxa, and I shared that distinction with less than a dozen others who had seen Ix's prophecy and martyrdom on Briand before that miserable world had gone up in mutual complete genocide between its cultures. Of those few of us who had known Ix in those few heady weeks when it seemed he might bring peace to Briand, I was the one who had been closest to him, by far, the only surviving witness to the secret ceremonies by which he had been anointed and renamed, the only survivor of those who had heard his first teachings, and perhaps the only one who had really been his friend. Perhaps a third of what was known of his teachings was known only from my published accounts; it drove most Ixists a little crazy that I had never put on the robe and dagger of their faith.

The music and poetry come when they wish and do what they will; after fifteen stanyears of mostly silence, I had written a set of cansos that could easily be interpreted as my thoughts and feelings about having known Ix, though the glory of Occitan verse is its fusion of deep ambiguity to strong specificity, so I could very well have pretended it wasn't about that. Perhaps for the sake of my longevity, I should have.

Whatever the connections might be, once I recorded the Ix Cycle, attempts on my life had come very quickly, apparently from the same people who had been trying to kill me all along. And the only clues we had so far were worse than ambiguous, so my main function in the operation was as bait. "There are about thirty other people involved in the recording—musicians, not commandos," I pointed out. "Can you provide security for everyone involved?"

"Yes," Margaret said, impatiently. "You know how I feel about ordinary citizens being hurt. If you hire a boy to bang a triangle in one song, I will have him under full surveillance with armed response ready, till we know for sure that every one of the opponents are killed or captured. Have I ever been stingy with a budget when lives were at stake?"

"Never," I admitted. "And although Paxa probably told you that I had a couple of stress reactions the day after, I'm fine now. What's really eating at me is that there's something wrong about everything connected with this. Everything feels like a set-up; they did a great job of planting each assassin and then each one was so incompetent. And then such a perfect job of covering tracks afterwards. All we know about them is that they leave a few traces of connection to Ixism during the brief period when their false IDs exist, and they are all genetically unknown but connected to families that are likely to have some cousins in Noucatharia and maybe the other Union colonies. That's all, after six of them—brilliant security. And yet . . . that one at the concert with a mini-springer under his robe—instead of a military maser, why didn't they pass him opera glasses with a concealed through-the-optics maser embedded? The first any of us would have known would have been when my head blew up.

"Then the one that tried to kill me in the bathtub—why send a man, instead of nerve gas or neutrons? They hacked a springer code—which is damned hard—and then they used that brilliant work to send a toszet so poorly trained, or so inept, that with his maser already drawn he couldn't kill a naked, unarmed man in a tub on two seconds warning. "

Dad puffed out his cheeks and looked up at the ceiling, hands behind his head. It still disconcerted me a bit to see his "This is important and I have to think about it" gesture coming from a small boy. "Lousy operations and execution, super-sophisticated prep."

"And perfect cover-up—brain bombs aren't easy either," Raimbaut said. "The surgery hurts and requires a while to recover from, it's high risk—"

Laprada nodded, now, too. "But within the last six stanyears they have been

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willing to have seven of their members undergo extensive, painful surgery, retrain them afterwards, and then get them killed—"

"In stupid amateurish operational failures," I said, finishing it. "All riddled with tumors, too. They send sick kids with no training time after time. This doesn't look like they are *trying* to kill me. It looks like they are trying to convince me that they are trying to kill me. That makes me nervous. I feel like I'm one step from the trigger of an expertly baited trap. What happens if I step on the trigger?"

"I was thinking," Laprada said, "that they might just be trying to scare you. The trouble is, they *might* have killed you with any of their six attempts. So it might not be their most preferred outcome, but apparently it would be all right—with their side—if you were killed."

Dad was nodding, that expression he had whenever he felt he'd resolved a problem. "Here's a different way to look at things: they clearly don't teach the assassin much of anything, so my guess is that none of the assassins has known enough to have been any use to us even if we had captured one. And then they go to all the trouble and expense of the brain bomb. That looks to me like whatever the big secret might be, they think that if we get our hands on one little thread, the whole thing will unravel. They have been consistently acting as if they're in great danger from us. Chances are they're right. We just don't know what the danger is specifically. If you keep recording, and provoke them into trying again, sooner or later they'll screw up, and suddenly whatever is going on will be obvious, and we'll have them."

"Well, then," Margaret said. "I think your team is making a better case than I could."

I sighed. "And you would all like to see me get back to work because you're worried about the state I have been getting myself into over Paxa leaving."

"That too," Dad said quietly, his piping treble less noticeable because he was so serious. "You do have to let your friends like you, you know. Even if they're your teammates, or your family."

"Or your boss," Margaret added from the screen.

I shrugged. "I can't fight all of you. Tomorrow I get up and get to work. Plant the right stories in the news media and among my fans; despite his grief at the departure of his longtime *entendendora*, and in defiance of the threats of the unknown terrorists he characterizes as 'sissies,' etcetera, blah blah, hard at work on the Ix Cycle, master recording expected soon. And don't forget to tell them the live concert version is out there and available at reasonable prices."

Laprada grinned at me. "Why, how arrogant and rude and condescending! The ancient monster of ego is back!"

I opened my mouth but everyone, including Laprada, said "Horrid brat" in unison before I could, so, feebly, I said, "Well, I guess I *am* back, at that."

It was still dark when I opened my eyes; Noupeitau had a réverbère law to keep most light focused downward, and the city's narrow streets were purposely dim and shadowy. In a garret bedroom, with the windows another two meters above me, most of the light was Wilson's soot-filtered dim red starlight. I rose, dressed, showered, and finally looked at the time. Three o'clock, two hours till dawn. I had probably gotten up at two-thirty or so, after just four hours of sleep.

Oh, well, I could adjust later, and meanwhile, here I was, wide awake. I ate two fried eggs in tomato sauce, a slice of black bread, and a pear over the sink, followed with two big mugs of strong black coffee while I sat and made notes for the mix and edit.

In the dark street, every light framed looming Gothic archways and windows,

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low trees over cobble stoned pavements, or dim spires disappearing upward toward the soft red-swaddled stars. From two of the narrow descending staircases, I caught glimpses of the bay, flat and reflective as an obsidian mirror, its slow-swelling surface glinting with hazy stars like rubies on black velvet by candlelight.

It was at least as suitable a setting for the grieving lover as it had been for the joyful couple.

At the studio, I poured a cup of coffee, stretched, pulled up my chair, and called up the takes of "Non te sai, *midons*". The screen went berserk with text messages, scrolling too fast for me to read. The speakers roared with snowy hiss.

I hit reset. The screen went dark and came back up.

NO FILES.

Of course, I had none selected, since I had hit reset.

I selected the list of takes again, and pushed—

NO FILES.

I commed my personal copy of Offisa-Pup, the OSP's standard security aintellect. It said, "Sir, all files are showing nothing but alternating one and zero binary. May I secure all backups before we proceed?"

"Yes, thank—"

"Sir, as soon as I tried to secure the first accessible backup, a very fast worm tore through it, destroying all the data. I have surrounded and locked down the remaining nine on-line backups and I suggest you secure any offline backups and not prevent prevent prev—"

I was shouting "Override stop" and pounding the reset key, but too late; the voice continued, less and less like my good old trusted aintellect.

"—prevent the teachings of a filthy savage from promulgating—"

I grabbed the four physical recordings off the racks and stuffed them into my bag. The studio door auto-locked with a clang. The lights went out.

I heard an unmistakable smash even through the booth soundproofing. Claphammer.

Someone in the building had just blown down a door.

I shouted "OSP Eight Eight Eight," the emergency call that, picked up by any aintellect's sensors, would be relayed at once to the OSP for voice verification, and if authentic would bring CSPs with weapons drawn as quickly as they could be sprung.

Another claphammer fired, closer. Still pitch dark. I drew a breath, forced myself to remember where everything had been in this room just before the lights went out. I picked up a chair, and checked that the strap of my bag, which contained the only copies I could be sure of, was still on my shoulder. Accidentally that saved me.

When I heard the studio door click to unlocked, I swung the chair as hard as I could against the window, but my hand caught on the strap of my bag. I lost my balance and fell prone.

The chair bounced back with a loud thud, having no effect on the window, but it hit my attacker.

She could see perfectly with her passive-infrared goggles, but lost the time to burn a hole in my chest when the tumbling chair hit her; when she lashed out to fend it off, her goggles slipped off—at least I think so.

For your first few stanyears of study, *ki hara do* is a sport or a dance or a form of exercise; for some decades after, it is a system of fighting that gradually becomes a way of life and a philosophy. But by the time you are fifty, if you started at age seven as I did, it is like walking or blinking. Several of the advanced katas are "found weapon" katas, and I had been teaching the advanced katas for decades.

I rolled onto my back, feet pointed toward the door.

Sound of chair hitting opponent.

Opponent probably has weapon in right hand.

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Solve problem.

I came forward to my feet, staying low. The chair crashing behind her told me she had over-cleared, swinging her arm too far and fast, slapping the chair far away with a big swing of her arm, instead of deflecting it just enough to miss her.

My mind's eye saw her bringing her weapon back around as I took two steps and swung my hand downward in a monkey-paw, feeling for her outstretched—

Wrist.

There.

Problem solved.

I put my shoulder into her jaw, grasped and turned her wrist, and hammerfisted her elbow; it crunched.

I smashed the backs of her knuckles against the table edge. She dropped the weapon.

I yanked her broken arm past my shoulder, hard, and with my free hand I shoved the front edge of her helmet away in a motion like drawing a bow, as I had taught people for decades. The ball of my foot pressed into the hollow at the back of her ankle, and she fell over the legs of the chair behind her.

Never send your body where a weapon can go instead.

I remembered racks of metal boxes above the table. Yes, right. I lifted each one over my head and hurled it downward onto her supine body, grab-lift-turn-throw, perhaps one box per second. After the second one, she didn't cry out, but to judge by the soft thuds, all five hit her somewhere, anyway.

As I threw the last, a thud reverberated through the floor. Definitely another assassin with a brain bomb; I reminded myself not to look at her when—

The lights came on. CSPs in battle armor were looking in the windows of the booth. I raised my hands. "Request positive ID as OSP Seniormost Field Agent Giraut Leones—"

"So identified," an aintellect said over the speakers, and the CSPs raised their visors. Margaret walked into the room, flanked by two more CSPs, shaking her head and smiling. "I can't leave you by yourself for a minute, can I, *compañon*?"

Pertz's was where all of Raimbaut's and my adventures had begun—his, the night he was killed and began his long journey through the psypyx; mine, a few weeks later with a royal *semosta* that sent Aimeric, Bieris, and me across the then-unimaginable six and a half light years to the Mufrid system. This had been the threshold I crossed to discover how much more universe there was than the tiny clot of singing, brawling drunks I had lived in.

When I had first come to it, Pertz's had been a Traditionalist place—at the time the Interstellars called us Oldstyles, and we refused to call ourselves anything because we were the only thing there should be in Nou Occitan.

Around the time of Yseut's disastrous reign, and Marcabru's moment of fame as the Imploding Prince, Pertz's had become a popular hangout for Interstellars. Then, as the whole jovent tradition collapsed under the impact of the Connect Boom, Pertz's became the place where a young man or woman out to carve a commercial empire might hang around with similar predators. Now those passionate young capitalists were as gone as the jovents and the Interstellars before them. The regular crowd was now older, a few of every crowd it had once had, the people who had just never stopped going there.

Pertz's was a sort of monument to all the places it had been. It still had the traditional Wall of Honor, the collection of vus of customers who had died (or lost a body—when I was young, before psypyx typing was discovered, the two were much more synonymous). Facing it, in a nice bit of irony, was a collection of the bizarre sadoporn hardware that had been worn or used by the patrons during the Interstellar period. During

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his glory days with the young-and-the-greedy, Pertz had added an extremely good bar-food menu. Now it was just a pleasant tavern, Pertz's place to drink and talk and play chess. Most booth tables had an inlaid chessboard and a rack of chessmen on the wall above the condiments.

Pertz said hello to all of us; he had attended my wedding to Margaret, he knew Raimbaut from the old days, and of course through us he'd met Dad and Laprada many times.

We took a large table at the back, though nothing we had to say was really secret and part of the point of being here was so that OSP watchers might spot someone or something trying to eavesdrop on us.

Margaret looked into my eyes. "Three attempts on your life. And your best friend and lover decided to leave you. All that in the last few days. If you really just want to go lie on a beach, or take that grand tour of Predecessor ruins that you're always talking about doing a song cycle about, or spend three weeks drunk in Hedonia—feeling sorry for yourself all the way—say so. Nobody would have a better right.

"Paxa wanted to come out of retirement to body-guard you. I said no. She's UT, you're not, getting killed matters less to you than it would to her. And it was easier for her to take that as an order from me." She paused, looked at all of us, wet her lips. "So I behaved just like a section chief, deciding your private life for you without asking. Shan himself couldn't have been ruder or pushier, could he? Are you angry with me?"

"Of course not," I said.

"I was asking the whole team."

Dad sighed. "You were right, Margaret. Paxa's a good fighter in a tight spot but we have plenty of those."

Raimbaut was nodding; he was uncharacteristically quiet today. Laprada made one of her little fluttery "No matter" gestures.

I shrugged. "What you did seems exactly right to me, and you're right, easier for you to tell Paxa, 'No, you gave me your resignation, and you're still resigned, and that's an order' than for me to try to be rational when my whole heart would be screaming that I wanted her back. But anyway I don't want to go lie on a beach, either." I looked around at the team; it still felt strange not to have Paxa at my side.

"We got results back from the assassin this time," Margaret said. "More than before. Probably the way you crushed her skull kept the brain bomb from detonating completely. DNA is the usual story, someone with a lot of Occitan cousins. We also have the usual situation of a teenager with whole body cancer. New things are, one, not nearly as many formed pathways as there should be in the brain; this person just woke up yesterday, doesn't have much that looks like life experience, and that fits with—two, this person is not a person. It was a chimera."

Chimeras are often thought of as the single most disgusting problem the OSP copes with, and we deal with slavery, pharmgeneered addictives, thrill murder for hire, hobby terrorism, and child mutilations as regular parts of our beat.

A chimera is a mix-merged personality. You have to commit four different capital crimes to make one, and only the larger crime syndicates usually do, not because it's difficult but because of the number of people who have to know and the amount of covering up you have to do—you had to steal the psypyxes, perform illegal internal implantations, and conceal the chimera for years until the personality fully fused; all of those were capital crimes, and making a chimera was a mandatory capital crime.

The usual way is to put two or more psypyxes on the same brain permanently, as internal implants rather than in sockets, and just letting the Chandreseki bonds grow wild forever, between the psypyxes and whatever host mind there

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was (usually the host mind is mostly wiped, involuntarily because the process is a living death and any at-all normal host would resist). Theoretically a chimera eventually becomes a completely merged mind, with both sets of memories and a fused personality, but usually it's caught early in the process because it's functionally helpless for years and it's at least a decade of stanyears before chimera can pass among regular humans.

There are a dozen different wildly illegal things that chimeras have been used for.

I had been involved in tracking down and terminating three chimeras. Human space does not need the sort of person you get from a fusion of a political fanatic, a serial killer, and a combat engineer into a world-class athlete; that was the first one. I had also shut down a financial genius grafted onto a sociopathic drug runner, and the strange but logical fusion of a famous actress, an infamous courtesan, and an overachieving contract killer into a body that was being systematically engineered for beauty.

"Do you know who or what they had loaded into that poor kid?" I asked.

"Not so far, and we probably won't. The brain bomb smashed three implanted psypyxes, but there was enough left so that we could tell that they were psypyxes, and that there had been three of them. More than we ever knew before."

Dad nodded. "And that answers the question about those cancer-ridden teens. They're not kidnapped, and they're not fanatics, as we'd been guessing. They're fresh from the tank, and they've been in accelerated growth since they were fetuses which is why they have whole body cancer."

Laprada was nodding vigorously. "That has to be it. Normally you don't dare tank-grow a body any faster than two and a half times normal speed, that's why you have to wait two years for your clone body when you do a regular psypyx transfer, and it's physically a four-year-old when you're implanted. These bodies could have been grown in as little as a year. And then they load them with striped down psypyxes that don't contain much more than the needed information and their orders and a few very basic skills, and launch them at Giraut before they start to develop much of a personality of their own, or even fully integrate control of the body—"

"But why do it that way?"

"If we ever capture one," Margaret said, "Nine to one, it will turn out to be more like a robot than a person, or at best sort of an idiot-savant—severely retarded except for a few grafted-in skills and its orders—and we'll probably just copy its mind for data and then euthanize it because with the cancers it will have, there won't be much more than a stanyear or two of life left to it." She shuddered. "I do not like how much sense this is making. If the others were similar chimeras, no wonder they were never very capable, but the other side had no problem sending them after you; they were as expendable as bullets. But I now really hope they weren't from the Lost Legion. You know how much affection I have for your culture, Giraut, Raimbaut, Johan-Guilhem. I'd prefer that the Lost Legion be a desperately romantic problem, not something connected with monsters like this."

"I was thinking much the same thing," I admitted.

Much of the reason why I had come back to Noupeitau to make the master recording of the Ix Cycle was the Lost Legion problem. The Council of Humanity had dithered and waffled for decades about using springer-fueled spacecraft, which could get to within as many nines of lightspeed as you needed, to extend the human settlement frontier beyond our little sphere less than 100 light years across, the boundary determined by the old technology of half-light-speed and imperfect suspended animation. Simul-

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taneously the Council had been trying to integrate the Thousand Cultures (actually 1228 scattered across 26 extrasolar planets, or 1226 on 25 now that Briand was lost)—that was what the OSP was for. And when you simultaneously leave a cheap, accessible frontier for another day, and dispossess and infuriate a large number of minorities, you get what we now had—somewhere in the direction of Boötes, Ursa Major, and Leo, there was Union, a loose association of illegal colonies, one of which was Noucatharia, on a planet called Aurenga that might be orbiting any of thirty stars. Noucatharia had been founded by the radical Traditionals, many of them associated with the short-lived Leghio Occitan when that had been a CSP unit, before being disbanded after its disgraceful conduct in the Utilitopia Massacre.

Margaret and I had so many connections to that incident that we both reflexively winced whenever anyone mentioned anything connected with it. Certainly it made perfect sense that the Lost Legion's tentative feelers toward the OSP had been toward us. Whether this was a faction of the Lost Legion, or the colony of Noucatharia, or all of Union, reaching out to us, we didn't know yet, but in general talk is better than gunfire, and when they offer to talk, you try to listen, so I was here because they had been trying harder than usual, and because the Lost Legion had more sympathizers (and probably more outright agents) here than anywhere else in Council-controlled space.

"From everything we know of them," I said, "the Lost Legion shouldn't be attempting anything of the kind. If they wanted to kill me they'd be better off doing it without warning, and I assure you Occitans would not resort to anything so byzantine as stalking me with chimeras; they'd do something to put themselves into insane glorious danger, that's the cultural style. So my guess would be that there's a faction that wants some kind of truce or peace talks, and another faction trying to derail the process, and we want to make contact with the former and ally with them against the latter, and since both of them are equally illegal in the eyes of most of the Council, it's going to take a while before our would-be friends trust us enough to make full contact. Meanwhile, the things to do are to keep from getting killed and be around for the Lost Legion to approach. I don't know that we have any other choices."

Margaret looked around the room, getting nods from Dad, Raimbaut, and Laprada. "All right, you're making sense to me, and your team is with you. Literally, now—because I want them to stay in your spare bedrooms for the rest of your time here." They all nodded emphatically so I knew there was no point in arguing about that. "Any other thoughts?"

"Lots, none relevant." What I was really thinking was a mixture of *I miss Paxa* and *I'm proud of my team* and *I have a great idea for what the horns can do in three of the songs.* They were right; we were playing chicken with the other side, in the dark. If we held our nerve, and they screwed up, we won; if I got killed on the way there, well, Raimbaut could find out what it was like to wear my psypyx, as I had once worn his. It was worth the gamble. "I'll try to get a fresh psypyx recording made every other day or so," I said. "Since I'm going to be a target, and they might get lucky, and it'll help to preserve continuity if I get interrupted while I'm working on the Ix Cycle."

My letter hadn't been out to the musicians for twenty minutes when I had a com call from Azalais, the cellist. I remembered I'd had three long conversations with her about Ix; she was a passionate Ixist, and I had almost not hired her because of it, but she was a superb cellist and her voice was a very welcome strong alto in the backing vocals,

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so I had taken the chance. In the little recording we had done before Paxa's departure, she had distinguished herself as one of the best musicians I had hired.

And she had thick iron-gray hair that I judged had once been red or honey blonde. Traditionally we Occitans wear our age, a custom that gets us stared at through most of the Thousand Cultures—I had met many people who had never met a gray-haired balding man before. I had been away long enough to find that exotic and interesting; she had a fine strong body that she'd kept in shape, as well. It didn't make her a better cellist but it did rather influence me.

So I didn't mind talking with her about Ix, too much. I even kind of enjoyed correcting her, as a way of needling her, in that most entertaining form of flirtation.

She had only needed to send a text response, but she chose to com on full visual, from the beach to judge by the view from the shoulders up. "Count me in," she said. "And I think I can help you find musicians trained in the old way, since you said you needed some."

"Are they all Ixist?"

"Would that be a problem?"

"Not if they all play like you."

She glanced down and came up with a very warm smile under slightly disordered hair. "How long does a *toszet* have to be away before he loses the habit of flattery?"

"Well, longer than I've been, obviously." I considered asking her how long before she lost that nice trick with the hair and smile, but it wasn't quite time for that sort of flirtation, yet.

"Obviously."

"Well, then . . . so will they all be Ixist?"

"Yes. As artists *and* as Ixists, we will all want this recording to be good, and to be what you intend."

"Azalais, remind me who is doing who the favor? And do you suppose we could have lunch together sometime soon?"

Azalais and I had lunch together every day for the rest of the week. Her only two subjects of conversation were music and Ix. I didn't mind.

Listening to her, I learned that Ix's most trivial sayings had become "the heart of his message" or "what he was really trying to tell us."

Azalais could not see how "you of all people, who so clearly listened to him, and with such attention, seem so determined to dismiss it."

"I *am* giving a substantial part of my life and talents to describing the experience. Because it was meaningful. But also because I don't feel so certain about what it means."

We were looking from a café terrace out over Platzbori, the broad beach that stretched for seven kilometers north of Noupeitau, on this last afternoon before resuming recording, celebrating my promotion of Azalais to producer (she hadn't mentioned her many producing credits; other musicians had).

So we had come to the warm red beach that sloped down from the space-black rocks, where it was said that half of the love affairs in Noupeitau started. Behind us, the eternal haze blurred the mountains to the northeast into impressionism. South of us, the newer suburbs of Noupeitau curled around the bay like a sleepy cat. In Wilson's always-dirty air I couldn't really see the high-peaked tile roofs, white walls spattered gray by sooty rain, jumbled mess of apses, niches, and windows, or low round towers and spires fretted with corroding gray-white gingerbread, but I knew what I was looking at even if I couldn't see it.

Totzmare rolled ponderous waves at us from the west. A crowd of mostly-naked young men and women rushed by, kicking a ball and calling to each other in a kilometers-long improvisational soccer game, which we had seen go by twice before. "When we were young," I said, "Boys and girls never played any game together after age eight or so. Men and women could do things like camp

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or hike together, but not any real sport."

She looked away to where the blue-black sea met the pink sky. "Do you ever miss the old ways, before the springer?"

I sipped my wine. A big slow wave rolled in, far out to sea, and a few skimmers climbed onto it. "In that world I'd have been a drunken brawler and a silly show-off. I might have died the same miserable, foolish death my *companhon* Marcabru did. Going out and finding the bigger world, and letting it change me, was the best thing that could have happened to me."

"Even including knowing Ix?"

Deu. Again. "Azalais, I'm creating one of my major works around that experience. That's not exactly ignoring it."

She shook her head impatiently. "But to have walked on Briand, as he did . . . to have known his companions, and to have sat and listened to the Beloved Auvaiyar—"

"I spent more time with Tzi'quin than I did with Ix or any of his disciples."

She winced at the name of the one-time disciple who killed both Auvaiyar and Ix. I pressed the point: "Certainly Auvaiyar was not 'Beloved' by any of his other disciples. They thought she was a presumptuous, pushy slut. She thought they were blind, silly prigs. All of them were right, too." Then, seeing how stricken she looked, I added, "I have never had any other experience like knowing Ix. But if you pay adequate attention, you never *do* meet anyone like anyone else—a point Ix made often, by the way."

Azalais seemed to seek a message in the tablecloth. "It would be easier if you just denied him."

She played with her hands on the table in front of her, rolling them over each other. Long ago, I had had some friend or lover with just that gesture. I faintly recalled that the gesture had embarrassed me in front of my *companho*.

"I don't deny Ix," I said. "Far from it. To deny him I'd have to believe in him first, and I have never thought of him as anything other than a reasonably good human being trying to say the things that needed saying, to the Mayans so that they'd extend a hand in friendship to the Tamils, and to the Tamils so that they'd take it. The things he said were *good* ideas, but not deep or difficult or profound. None of what he taught was."

"But you admit you had a profound experience—"

"My experience was profound, not his ideas. I was living through a miserable year—divorce, betrayal by a trusted mentor, failed mission, a long wretched list. When your whole life blows to shit, you go looking for wisdom. But ask any drunk who ever stopped drinking . . . it wasn't the ***brilliance*** of the idea that overwhelmed him."

"You can't mean," she said, meaning that she knew I meant it, "that a message that has inspired—"

"Prophets never say anything new. There's nothing in Ix's teachings that you won't find in Buddha or Moses. We always already know: Treat other people kindly because kindness matters even when it is not returned. Courage matters even if you lose. Don't dwell on the pleasures of things that you feel it is wrong to do. Try to live your days as if you were grateful for them. Love your neighbor, and keep your definition of 'neighbor' broad.

"Everything the human race knows about living well and living together fits onto a few sheets of paper in big type. One prophet after another tells us the same thing. The hard part isn't to think of it, which has already been done, or to understand it, which any child can do, but to do it."

There were more teeth in her smile and more crinkles in her eyes than I had seen before. "Giraut," she said, "I think Ix had a profound effect on you." She took my hand.

I looked down at our hands, and up at her. Not bad; one way I knew Azalais really was Occitan was that she had perfect first-blush-of-romance technique. I

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was glad to be fifty, and gladder still that the "young mother" at the next table (in bug-eye sunglasses, billowy dress, and pregnancy pad) was Laprada, and that her bored little boy in a sailor suit, fidgeting and acting up to cover his staying close enough to listen in, was Dad.

As we strolled hand in hand back to Azalais's apartment, in the north suburbs, I didn't bother to look at the muscular young man in the wet suit, carrying a surfboard, behind us. I knew he would disappear shortly after a little boy in flip-flops and bathing suit, with a big sand pail, drifted into the crowd beside us, or a pretty young woman in headscarf, bathing suit, cover-up, and VR glasses wandered across our path and drifted in our direction.

The OSP has a fine tradition that as long as your shadows are on you, taking the bait is expected. There are worse jobs and worse employers.

I declined Azalais's invitation to stay the night, though it was a pretty nice invitation, accompanied by a very long, slow, sweet kiss. I went through her springer into the one in my bedroom, and was finishing my shower and had just told the bathroom aintellect to spring me in a cup of coffee when Raimbaut tapped the bathroom door and said, "Are you decent?"

"I was just told I'm pretty good, actually."

There was a chorus of razzing noises, and Dad's boy-treble piped, "I want you all to know he gets that from his mother's side of the family."

I turned off the shower. "Out in a few minutes." I set the towel for max dry, and brushed with it once lightly to get all the water off.

Margaret had left a full report. When we had all settled with coffee, her face appeared on my wall. "Hi, Giraut and team, here's what we've got. You were right that you knew Azalais from somewhere before. She was your *entendendora* for most of the year you were nineteen."

I had tripped over a blind side of my cultural heritage. In the tradition of *finamor*, a jovent was supposed to have an *entendendora*, a donzelha whom he would worship, consider perfect, make art for and about, and fight in defense of. If you are required to think of someone as perfect, paying too much attention to her will get in the way; there was a saying for centuries that if you were tired of listening to a female friend, you should make her your *entendendora*. I had had several *entendendoras*, and I'm sure some of them were very nice, but I hadn't known any of them terribly well while she was my *entendendora*.

I really should have remembered Azalais. While she had been my *entendendora*, we had hiked and camped together all over Terraust, and more than once we had walked all night along Platzbori with just a big flask of red wine, holding hands and talking about the universe. (Well, all right, I was talking, she was listening. That was the way things were in Nou Occitan at that time. Is there no statute of limitations on cultural embarrassments?)

You would think that after a year gazing adoringly at Azalais, I wouldn't be able to forget what she looked like, but adoration works on a memory as petroleum jelly does on a camera lens. Besides, when we had both been young, Azalais had had thick straw-gold hair, fewer freckles, and an excruciatingly tiny waist. She had plucked her eyebrows differently, too. Had that puckish half-smile developed in the intervening years? I hoped I would have remembered it.

"Well," I said, "all right, it has been established that I am an idiot and not a very perceptive one, even for an idiot."

The aintellect said, "I had not been instructed to be prepared for humor in this situation. Should I obtain and install a humor-and-irony module to better understand your responses and questions?"

"Considering it's this crowd," I said,

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"yes, you should. Take the time you need to find one that's comfortable, and install it. Thank you for thinking of that—it was a good idea."

Everyone was staring at me.

After a moment, Dad said, "For some reason I never quite pictured you going soft on machines, though I know Paxa always was."

I shrugged. "Can I get everyone a beer?"

When we resumed, the aintellect seemed to be in very good spirits, and eager to please—perhaps Paxa was right that treating them kindly was only in our self-interest.

After being my *entendendora*, Azalais de Mont-Belh had spent almost two years as the *entendendora* of Ebles Ribaterra, a passionate and hotheaded Traditional (jovent society at the time was bitterly divided between the Interstellars and the Traditionals; Raimbaut had lost his born body in a brawl with Interstellars.)

Ribaterra had enlisted in the Leghio Occitan. Most citizens of human space knew three things about Nou Occitan, if they knew anything: Bieris Real's landscapes, my songs, and the Occitan Legion's Utilitopia Massacre.

Thanks to the Leghio Occitan, a hundred stanyears from now I would probably still be expected to turn abruptly violent in public.

The Leghio Occitan had been disbanded, its colors permanently withdrawn, and Occitan units were forbidden for the next fifty stanyears; Occitans could serve only in the "rainbow" CSP units, the ones deliberately made up of a cultural mixture.

Ribaterra had not been among the worst; he had merely beaten a bound prisoner about the face, not mutilated or killed her. He had come home and served his year of parole quietly. To all appearances, as a member of Queen Yseut's court, whose behavior must be impeccable, Azalais had dismissed Ebles as her *entendendor*.

Forty days after the end of his parole, Ebles Ribaterra vanished from all records.

Azalais drifted in and out of extremist Traditional organizations for another three years, then abruptly ceased political activity, entered the conservatory, and became serious about her cello. She quietly converted to Ixism a decade later, one of the first Ixists on Wilson. And ever since, she had been living quietly—so quietly that sometimes she didn't seem to be anywhere on the planet at all for periods of as much as a stanyear, though there was also no record of her having sprung off-planet.

"Clear as sunlight after a four-days rain," Raimbaut said. "As I read the story, Ribaterra and Azalais hid their relationship because she had a good position at court. Then he vanished—maybe telling her he was going somewhere, probably not—and she drifted into extremist groups.

"She was probably not too far from getting involved in running guns or planting bombs, when she got a visit from dear old Ebles. Classic pattern—strongly subversive opinions, suddenly drops them totally, moves somewhere to live quietly."

"Where do you fit the Ixism in?" Laprada asked.

"I can't fit it in. I was going to sweep it under the carpet and stomp it flat," Raimbaut admitted. "No idea. There is nothing about the Ixists, except their attachment to Giraut, that even faintly suggests a connection to Nou Occitan. The Ixists are about as Interstellar-Metacultural as a religion can be—the whole message is about isolating cultural differences into interesting little fetishes to amuse each other, and cherishing other people's cultures . . . I can hardly think of anything that would have appealed *less* to ultraculturalist nuts like the Traditionals."

"Hey, we were two of those nuts," I pointed out to Raimbaut.

"We were proto-nuts. Traditionalism

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didn't become really goofy until Prince-Consort Marcabru took things to such extremes. By that time you were in the middle of a revolution, and I was dead."

"We were just lucky," I said. "Does anyone have any more questions for the report?"

No one did.

"All right, we're through," I told the aintellect. "See if you can find the number of suspected ultraculturalists and Lost Legion contacts who have become Ixist in the last few stanyears. It might take some considerable creativity, since Ixists don't hold services or register converts, and 'ultraculturalist,' 'Traditional,' and 'Lost Legion contacts' are all fuzzy terms."

"Yes, sir, thank you, sir."

"Thank you. You're an excellent aintellect."

This time no one stared, so I suppose they were getting used to my resolution to be polite to aintellects.

Little vows like that were sometimes all that was left of a love affair. That idea might have a song in it. I unfolded my computer to play with the idea of "tiny promises that make you now who you were then." I couldn't make it phrase in Occitan.

As Azalais had promised, the Ixist musicians were a blessing and a gift. Songs came together quickly and well, and we worked late nights only because it was sometimes too much fun to stop.

Azalais and I still found time for some long breakfasts and slow lovemaking. Not once did she mention that she had been my *entendendora*, or a close friend of Yseut, my then-best-friend's *entendendora*.

To confirm my legendary absent-mindedness, I took Azalais to "meet" Mother, who of course recognized her at once, realized I didn't, and could barely keep from laughing with delight all evening. The hilarious story of my unawareness spread from Mother into the wider circle of friends and relatives.

Meanwhile the adversary didn't try to kill me or destroy a recording again. Margaret found that puzzling. "Maybe they only had seven fanatical cancer-ridden teenagers in stock? They must know that attempts on your life won't frighten you into quitting."

"Oh, they frighten me—it's the 'quitting' part of the plan that isn't working, *midons*."

"Don't call me *midons*. We are not married any longer and I'm your boss, not your feudal lord." She sighed. "Oh, my, that *did* come out harsh."

"Oc, ja. Ver-tropa-ver."

She looked down at the desk in front of her and sat back. "I just don't want to see you dead. *Or* have you sidelined for god knows how long. I know we have to run this trap, but I hate baiting it with you. So I get angry at you about it."

"You're human, Margaret. And you're in charge of something very difficult. That's the way humans react, and that's why I want my boss to be a human, and not an aintellect."

Today was a break from recording, so Azalais and I had taken a long walk up Platzbori and back. Now we were at her apartment, broiling fresh fish, tomatoes, and cheese we had bought from stalls nearby. I was just slicing some bread, warm and fresh-sprung from the bakery in my home town, when she got a com call. She talked for a moment, said "Oh, yes, that would be fun," and clicked off.

Coming back into the kitchen, she asked "Didn't you tell me that Prince Consort Marcabru was one of your *companho* when you were younger?"

I had said that at least a hundred times, but I did my best to look mildly curious and surprised that she had remembered. "Yes, but, I was in Utilitopia for almost all that time while he was Prince Consort. I barely got back in time to give Marcabru the beating and humiliation he deserved while he was still Prince Consort." I regretted that brutal act as much as anything I had done in

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my life, but it sounded like something a Traditional might say.

"Men," she said, rolling her eyes. "Do you remember his friend Ebles Ribaterra?"

"I don't think I ever met him."

"Well, Ebles and I are dear old friends—he was my *entendendor* for a couple of years—and he's been traveling for a long time, but he's back in the city now, and he was wondering if he might drop in. I asked him to stay to dinner but he said he can't, but he did want to drop by just to say hello."

"Oh, well, certainly, *midons*, any old friend, and especially an old *entendendor*, you know how nobody ever forgets an *entendendor* or *entendendora*, and since he seems to be important to you—" I thought I was doing a splendid job of dithering.

"He *is* important to me."

We went on getting a light supper together, in the pale pink evening light that flooded her top floor apartment, which had a fine view of the market on one side of the building and a gorgeous view of the harbor from the other.

Footsteps on the stair, a knock at the door, Azalais opened it, and a tall thin man of about fifty stepped in, swept her up in his arms, kissed her briefly but enthusiastically, and stepped back to hold her at arms length, beaming down at her. He was about my age, one of those men who is avian all over—aquiline nose, receding chin, thatchy hair that seems feathery, like a fastidious vulture.

"You must be Ebles Ribaterra," I said.

"And I know that you are Giraut Leones. I have all your recordings and I'm barely restraining myself from babbling madly about how I love them all."

Well, even a convicted war criminal can have some good points. We shook hands.

We talked about Marcabru without discussing my infamous duel with him, or Azalais's time at court. Ribaterra managed not to allude to the fact that we had been on Nansen at the same time. I found ways not to refer to my part in the breakup of the Traditional movement. Anyone watching us might have thought that all the tension we weren't talking about was over Azalais.

He walked across the street to the nearest public springer, and I could see from the window that his whole back relaxed, and his gait became smoother, as soon as he was sure that he wasn't going to be arrested. I knew that feeling.

I had just decided to go to bed when the com chimed. "Identify?" I asked the house aintellect.

"Azalais de Mont-Belh. She sent it on low priority but her personal service aintellect says it's about something fun."

"Put her up, thanks."

I liked her grin, but then being likable was her job. "I went to a very dull party tonight, and left early," she said, "and now I'm in your neighborhood." Over her shoulder, I could see the shuttered front of a seafood restaurant, a few blocks away. "I am bored and not sleepy. And we start late tomorrow anyway because Rufeu and Sanha Malhea have to be late. If you'd like to be spontaneous and romantic and so forth, you and I could take a long night walk with good food in the middle of it. So . . . want to go to this place up above town that I've always loved? Quiet little place with reasonably priced wine, a pleasant owner, and good bar food? It's called Pertz's."

The other side was apparently investigating my ability to keep a straight face. "Sure," I said, "I'd like that."

Pertz himself was at the bar, and naturally enough, recognizing both of us, and remembering that we had once been in *finamor*, he raised a hand in greeting and shouted both our names. We stopped and had a pleasant, gossipy conversation with him, for a few minutes, and since it would have been awkward to continue the pretense that I had not recognized her, we didn't.

Pertz gave me one of his bear-pawed

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squeezes on the arm and told me to be back more often. As we went to a booth, Azalais said, "Well, *gratz'deu*, we can stop carrying on *that* act."

"My orders were to maintain it till you dropped it."

"Mine too. All right, now—there he is."

Ebles Ribaterra was sitting by himself in a booth. I followed Azalais there; she gestured for me to slide into the seat opposite Ebles, then said, "I'll be back in a minute," not really trying to make it convincing.

Ebles shrugged, looked at me, saw something that told him we didn't need to play any more.

I nodded. "Well, then. Ebles Ribaterra. Corporal in the Leghio Occitan on the day it was disbanded and mustered out. Member, Occitan Purification Society. Member, Old Trads Society. You never touch your support account from the culture government. Pattern of expenditures shows that you are on Wilson less than eight percent of the time. We think your permanent residence is in Noucatharia, whose location you are probably ordered to keep from me or any other Council agent at all costs."

"Not at all costs. We won't kill bystanders to preserve the secret. Our squeamishness on that point is why our most prominent dissident faction has been trying to kill you; they are afraid the Council will learn the whereabouts of Noucatharia and they hope that by killing our contact they can prevent that."

There were plenty of contacts besides me available, they didn't need any personal connection, and there was no obvious urgency, so that was a pretty obvious lie. But the game is the game, so I nodded as if he were unraveling a mystery for me.

"I am here," he said, "to discuss beginning the process of bringing Noucatharia under the Council of Humanity and regularizing its status. By a large majority in a recent plebiscite, we have decided to abandon independence—we're too small a colony for the problems we have. Most of us are sick of rhetoric and more interested in comfort. On the other hand we don't really want to be invaded and occupied, so we're trying to ensure that you would rather have a peaceable, orderly annexation, and a smooth, easy Connect, rather than a war and an occupation."

It might have been more plausible if he hadn't started with that first lie, but I doubted he had chosen what to say. "Well," I said, "tell me what you want me to know."

Ebles nodded. "Let me buy wine for the table—it will be a longish story. Aintellect, Hedon Gore please?"

The springer slot opened and a jug of wine and two glasses rolled out on a little cart. I put on my toxicology glove and dipped a finger in the wine. He put his on, did the same, poured, and said, "I believe that your OSP traditional toast is, 'Another round for humanity?'"

"'And one more for the good guys.' That's the one." We clinked glasses.

I didn't really expect ever to see Azalais again—a pity, because she was a fine cellist and producer, and I liked her.

It was my turn to propose a toast, so I simply said, "The profession," meaning being spies, and he nodded.

"Good choice. I know you're a Seniormost Field Agent. I'm a station chief in my much smaller outfit," he said.

"Union Intelligence?"

He shook his head. "Where Council space is a federation, Union's more of a loose alliance. People who think they are wits call it Disunion. So I'm with Noucathar Intelligence—which is about the size of a small town police department."

"And Azalais is one of your agents?"

"A stringer. She knows where I'm from and what I do, we were lovers long ago, and she's one of my best friends here. She does some small things for me. But the few times she visited Noucatharia, she didn't like it. She's happier

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here—for that matter, I'm happier here." He shrugged. "If I had it to do over again I'd have just lived down the shame and stayed home."

I was glad that I always went wired, because the next ten minutes would have been a lot to remember.

Almost the whole population of Noucatharia, which was the name of both the human settlement and the island on which it stood, was in the town of Masselha, which held only about three thousand people, half of them children.

"And Union? Where do they fit in?"

"We are the only culture with which you will be negotiating. There are no hidden partners and no strings pulled elsewhere in the process, and that is what I intend to tell you. Union, its nature if any, its existence or non-existence, is all irrelevant." He laughed and held up his glass of wine, as if studying the color. "Many of the extraterritorial colonies are in terrible trouble. Noucatharia more than most."

"Trouble of what kind?"

"Of a kind not easily understood without your coming and seeing it. But you may rely on this—we would not be approaching you if we did not need the rest of the human race."

"There is something bitter in the way you tell me these things."

"There is. It is true that Noucatharia is conducting the negotiations all by itself. But the reason is not just our terrible problems but because the rest of Union decided that we are perfect for a test case."

"And what makes you perfect?"

"We are the only colony on Aurenga. We are tiny, the problem I am purposely not naming is severe, our solar system is quite isolated and as long as we are careful not to leave springer codes lying about, if you do seize Aurenga, you won't find it's a bridgehead to anywhere else. So my little world has been selected for a test case, to see if we can trust the Council and if the Council will help us. I sound bitter because logical as it was for us to be the ones being sold out by the rest of Union, much as Union is compelled to do this, I cannot bring myself to like it."

"Well, then," I said, "tell me about Aurenga."

"We're an odd world," Ebles said. "If we had been closer in, I don't think we'd have been settled at all, during the First Diaspora."

"The first?" I asked.

"The founding of the Thousand Cultures. You call it the Diaspora because you didn't know there's been another one since. Aurenga is about seventy percent of Earth-sized—you could think of it as Söderblom with even more water, or a bigger young Mars with oceans, a smaller Wilson, or a smallish very wet proto-Venus. But in land area and population it's a mere speck."

The island of Noucatharia, about half the size of the Big Island of Hawaii, was a high part of a mountain plateau on a submerged continent. Aurenga's continents were all submerged, but plate tectonics were very active, and the more recent mountain ranges poked out above the water, so that about five percent of the surface area was dry land. The biggest contiguous bit of land was Serras-Lassús, a mountain chain standing almost three kilometers above the shallow equatorial sea, a wind-wave-and-storm break that protected Noucatharia and created a kind of Caribbean-but-more-so.

So much of Serras-Lassús was so vertical that it had only a few settlements, none of more than fifty people, along its inner, leeward face, and there were no plans to ever settle it much more extensively. Indeed, "by the standards of the First Diaspora, the whole planet only had about one fifth of one standard colony space of habitable land," Ebles said, a little defensively. "I know one rationale for the Council claiming jurisdiction over every bit of empty ground where people could live is that there's only so much land, and so many organi-

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zations would like to plant a culture—but in our case, it's doubtful anyone would use the land for anything else."

I nodded. "Well, at least you have a plausible line of defense if some idiot drags this into court. Is it ecologically long-term stable? You said it was kind of proto-Venus, with a young sun."

"Long term, no, it's not stable at all. Low surface gravity, low total mass, so the scale height is very high, with a very high and feeble cold trap. So a great deal of water gets into the upper atmosphere and photosplits, and the gravity can't hold the hydrogen. Even though Aurenga was abiotic before the Predecessors got there, it had a forty-five percent oxygen atmosphere, enough so that the Predecessors had to create organisms to pull oxygen out of the atmosphere for safety."

"When were the Predecessors there?"

"About a hundred thousand years ago. I suppose it's no secret that Aurenga is out in the direction of Hammarskjöld and they settled there long before they came here."

"And yet they failed there."

He seemed to think a moment before deciding what to say next. "Shall we drop the pretense? The other aliens, the ones we both call the Invaders, massacred them. As they did everywhere that either Union or Council explorers have ever found Predecessor ruins."

The existence of Hammarskjöld was supposed to be a secret, the mission there had been a deep-black OSP operation, and officially the public had not been told that we knew where the Predecessors had gone—or rather how they had gone down fighting. I made a mental note to urge Margaret and the Board not to bother trying to preserve any secrets about that aspect of the OSP's mission; our main rivals clearly knew most of what we did.

We had sat silently for a minute or so; clearly he had said all he wanted to say about the aliens at this point, so I prompted. "So Aurenga is not long-term stable?"

He shook his head. "But long enough for human purposes. Across the next quarter of a billion years, the sun will heat up and the dust will clear out of the inner system. Eventually the insolation will be at near-Venus levels, you'll get a runaway water-based greenhouse, the oceans will boil, the carbonates in the crust will release CO_2, and you'll have a Venus. Plus the moon will fall. Aurenga captured an icy planetesimal sometime in the last half-million years, so it has a big, highly reflective moon in steeply inclined orbit. Beautiful place, but we have not tamed it; we're just living there while it's still safe, or as safe as it was for the Predecessors, anyway.

"Meanwhile, it's an almost-paradise. We introduced all the Earth sea life we could get samples of, plus all the engineered stuff from all the oceans of all the settled worlds, just modifying it all to deal with the relatively low salinity. All that sea life had a population explosion—we could feed all of human space with all our fish. From the crosstree of a good-sized yacht, I've seen pods of whales extending to the horizon. Our harbors are dancing with porpoises, every river in Serras-Lassús is full of salmon, trout, and eels, there are penguins and polar bears on the polar islands, and we have beaches swarming with Söderblom mimic-seals, and of course levithi and aurocs-de-mer from Wilson, and . . . well, you must let me take you reef-diving, and then over a big plate of oysters and fresh crab, we can—"

I couldn't help laughing. "Ebles—may I call you by your first name, *donz*?—if they are going to make you retire as a spy, once Noucatharia joins the Council, I suggest you see if they'll let you head up the bureau of tourism. It sounds delightful. And I take it your mission is to invite me to Aurenga, to spend some time in Noucatharia making informal cultural contacts as a first step to more formal political connections later? Well,

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I'll accept, if you want me to."

"We wouldn't ask if we didn't."

"Are you sure? If Noucatharia accidentally allows us to learn of Aurenga's position, particularly if we get the address of any open springer on Aurenga, Council of Humanity policy is that you will be invaded and seized. "

Ebles looked down grimly at the table in front of him. "Things are in a such a state that we have little choice. I've completed my mission for tonight. Please stay. Azalais will be back soon anyway."

"I thought she was just the contact person."

"She is, Giraut, but *deu tropa gens*, she also really likes you. So treat her kindly, or it's a duel without limit with me." His avian features pulled up into a sharp grin that was uncomfortably vulture-like.

I smiled back. "It's good to be home."

"It is. Always."

"If you're done settling the problems of the universe," Azalais said, returning to the table, "I'm starving."

"Well, that's a problem I can settle, *midons*," I said. Ebles was gone as if he had vanished. I had a feeling that no matter how exactly I reported all of this to Margaret, I'd be leaving something important out. "Table Aintellect, can we get a platter of tapas, another glass, and another jug of Hedon Gore?"

I spent a moment fussing with getting the food and wine from the springer slot. When I looked back, Azalais's hands were resting on the table as if she might boost up and run, or as if she might grab me.

I reached forward and gently lifted her fingertips from the table with mine. "Azalais, whatever you're worried about, it's all right."

"Did he warn you that if you hurt me he'll eviscerate you?"

"No, but he did offer me duel without limit."

"Maybe he's losing confidence as he gets older." She sighed, but she looked me in the eye. "About our past connection. I suppose I should say 'Now you know' except I'm sure that you knew five minutes after our first contact."

"The OSP isn't quite that good, but I've known for a long time, yes. May I ask . . . "

"Anything!"

I deliberately leaned back and relaxed. "Just tell me, honestly, how much you've been involved. Partly so that I can report it accurately to my superiors, partly so that I can protect you from being swept up in more than you should be, mostly because I am fond of you, too, and enjoying our little *jeu di cor*, and would like to continue it. Of course I'm assuming you weren't part of the operation trying to kill me."

"No!"

"Thank you for looking so distressed, *midons*. Well, so . . . you were in *finamor* with Ebles—"

"And I was very passionately Traditional. I knew he had gone off to the Lost Legion colony. So five years later, without warning, Ebles turned up, said he'd never been able to forget me, and asked me to come with him to Noucatharia.

"At first it was the most beautiful place I had ever seen; springing there was like stepping through a door from the fake world to the real one. Everyone in Traditional clothing all the time. Real men carrying real weapons and treating me with real courtesy. And in their bright clear sunlight, with that perfect air that their island gets—like Earth air but with more oxygen—you could take a deep breath and imagine that you weren't on the planet Aurenga, today, but in the walled city of Aurenga in 1075, with the Great Conference of the *Trobadors* just starting, and all those wonderful voices performing in that magnificent thousand-year-old Roman theater, with Lord Raimbaut himself sitting in the place of honor."

"*If* that ever happened."

"*If* it did. What a natural qualifier that seems here—and what an odd one it

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would have seemed there in Masselha. I felt at home for the first time ever, Giraut. Everything so alive and so *real.*

"And then . . . well, Noucatharia has an underside that is excruciating if you've loved the place—like discovering some wanton cruelty in a lover. I know that Ebles plans to show that underside to you."

"And you won't say what it is, either?"

"No. You will eventually understand why." She sighed and looked down. "Anyway I came back here. To get away from the thing they are inviting you there to see. And to have time and space to play my music and to enjoy the things I enjoyed, while there was time."

"While there was time?"

"To enjoy them."

"I understood that part, but—"

She went on in a rush. "When Ebles said, 'We can get you hired to work on the recordings of the Ix Cycle,' well, there I was, and I did all the rest too. Only, you know . . . well, he told you about how I've come to feel. I guess I really wasn't cut out to be a spy."

I shrugged. "You might be a better spy than you think you are," I said. "The ability to like other people when you need to is not a trivial skill. And many people have trouble turning it off afterward. Especially—" I reached for her hand—"when there is no reason to."

"Will this be all right with your superiors?"

"As long as I'm not being played against them, they would think of it as something that might help." I was painfully aware how true that was; my marriage to Margaret had broken on the rock of an affair she had had with an informant, and Shan, my boss and best friend at the time, had encouraged it because of the information she was gaining. I could marry Azalais, or rape her and leave her dead in an alley, and Margaret's only concern in either case would be whether the OSP had gotten all the information it could out of the situation. "As far as I know, you've just been a messenger and a go-between in all this affair. No one is going to arrest you—if we were going to pick anyone up, it would be Ebles, but he's far too valuable as a contact with the Noucathars.

"You're doing superb work as the producer of the Ix Cycle, so I want you to continue. I like your company and I enjoy being with you in bed, so, of course, if you like, stay. My bosses at the OSP will ask if there's any advantage we can get from my association with you, probably conclude there isn't much, and back-file it till there is. Meanwhile, we can enjoy each other, it that's all right?"

"It would be lovely."

That turned into some sort of impromptu toast, and after we had clinked glasses and drunk, I asked, "Another question. Are you actually more Ixist than Ix, or is that part of your cover?"

"That part will continue," she said. "I really am Ixist. While I lived in Masselha, the story of Briand was all that anyone talked about for weeks—Ix's preaching, the crisis, the blazing death of a world."

"Are the Noucathars all Ixists?"

"Many, but not all—there's violent opposition. The ultratraditionalists that are trying to kill you have also murdered four prominent Ixists in Noucatharia, and Ebles thinks but can't prove that they are behind some anti-Ixist bombings and murders in Council space. The ultratrads were one of the reasons why I moved back here—I don't think I will take up the robe and dagger full time, ever—it seems very affected to me, and the opposite of what Ix meant to preach."

"That's my feeling as well, for what it's worth."

"I'll cite you as a source—but if I do, I don't want to be shot down on the street, or kidnapped and brutalized. And yes, the ultratrads have done all that in Noucatharia."

"And in Council space?"

"We think so. And it's so bizarre. I don't know how anyone can say that Ix-

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ism is anti-traditional—if people would just think seriously about Ix's works, and about the original Cathars—"

Well, I had virtually invited a sermon, and I got one. The wine and the food remained good (it was Pertz's), and everything else remained predictable (it was Azalais).

When we had finished the carafe of wine, Azalais was tired, so she just sprang home; we promised we'd have a real evening out soon.

Walking home from Pertz's, I reveled in the warmth of food and wine suffusing my tired body. The old familiar way down and west through the dark and silent streets of the sleeping city was like a comforting, too-often-seen movie playing in the background.

I rounded a corner close to a wall, ready to drop if I were fired on, or to close the distance and strike if there were someone waiting for me. I had not had that reflex as a jovent; Noupeitau had been an honorable place.

Nagging thoughts led me into an alley. I ran to the other end of it, slipped out on the shadowy side, and went through one public springer to emerge from another a few blocks away, one of the best and simplest methods of shaking a tail. The habits of safety can be soothing.

This new street was steeper and narrower, but a harder place for my probably nonexistent shadow to trail me.

New love stirring and old love lost—that feeling wanted to put on its clothing of music and words, and to merge with my general sense that I was in danger and being lied to. Between loves . . . between unknown menaces . . .

To the rhythm of my boot heels on the cobblestones, the phrases and the feelings tried to find each other.

The wrap party was so big I rented a pavilion with overnight apartments. We had more than thirty musicians, with a few friends each, and I was in my home culture, with many old friends around. Margaret, leaning up against the wall beside me, said, "You know, I think the last wrap party this big was while we were together—*Songs from Underneath*. That was a good party. Remember? We even got Shan to dance with me."

I laughed at the memory. Shan was a natural athlete who had been part of countless blood-and-thunder operations as a younger man, and still graceful as our solemn-faced, dignified older boss. On a whim, Margaret had asked him to dance. She had discovered that he was graceful and fun, and he'd ended up dancing with every woman (and all the men who would) at that party. Later that evening, he and I (aided by a bit of alcohol) had demonstrated that the Second Greater Kata of *ki hara do* made a very good line dance, each of us leading a line, and I was not sure that his was not the more graceful interpretation.

"Something about Shan kept us from understanding how much fun he really was, or could be," I agreed. "But his old cronies surely miss him. Qrala and Dji would love to have him back."

"They might yet get him back." Margaret made a wobbly gesture with her hand. "We are still trying to confirm that there was an illegal psypyx of him and that it is out there somewhere. The rumor is very definitely linked to the Lost Legion, so the most likely agent to find it is apt to be you."

"Interesting," I said. "And if I do find it?"

"Your mission is to figure out what I would have ordered you to do if I had known anything about it, and then do that." She took an almost-gulp of her big glass of Hedon Gore; Margaret rarely drank to get drunk but she looked drunk enough right now.

"All right," I said, "We worked together too long, Margaret. You've taken scrubbers and you're playing at getting drunk. You're working tonight."

She leaned back against the wall, her eyes unfocused, and swallowed some more. "Isn't it wonderful, sometimes, to

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have everyone think you're drunk, horny, and spilling your guts? It makes you look so harmless."

"It used to be one of our favorite tricks," I agreed. "If I can help, who's your target tonight?"

"He's not here yet." Margaret drained her glass and grabbed my arm. "I need a minor scene to cause some gossip. Can't be with you."

"Laprada and Raimbaut do a very nice quarrel—anywhere from a barely-detectable minor snippy tiff all the way up to her throwing plates at him. Remember I wrote up a commendation for that great one we did, the case where we caught the financier/drug-runner chimera?"

Margaret grinned. "That time when Raimbaut plunged her head into the punch bowl?"

"*Oc, ja, ver-tropa-ver*, that one. *Anc non vis bellazor, non be*? Turned out that both the financier and the drug-runner in that head liked 'em young, petite, and pale and had real Galahad complexes going. Seeing big bully Raimbaut brutalize poor little Laprada got our boy's attention. So he approached her the next day, offering to be her big strong protector and buy her the moon and the stars—very creepy, since she looked about fourteen at the time—and we arrested him stark naked in the room where he was waiting. Sprang him straight to destructive deconstruction; he was being torn apart five minutes after their 'date.'"

"Shan would have been proud of that op," Margaret agreed. "Well, alas, I won't need a performance at all like that one. Minor tiff will do everything I need. But I do need it from someone other than you, so I guess I'll go talk to Laprada about it. Besides, this is a party in your honor in your home culture. Shouldn't you be mixing and mingling with your other guests?"

I shrugged. "I don't get to see enough of you at times when there's no crisis. I've already circulated and shaken a lot of hands. And I'm trying not to spoil the evening for the musicians—who wants to spend extra time with the boss?"

She pointed at me, at herself, and flipped her hand palm up in question.

"I'm widely known to be a pervert," I explained.

"What, still?" a voice said behind me.

"Rufeu! You came! I didn't think you would!"

"Neither did I, but . . . well, you know how it is, *companhon*. After a while it's so good to be around someone that remembers." My old friend—he and Raimbaut, Marcabru and I, had all been *companho* at school together—was now physically a muscular athlete somewhere in his mid-twenties; he had died in a climbing accident and started his long journey back through the psypyx about the time that Margaret and I had been recruited for the OSP. But I knew what he meant; the psypyx gives you periodic escapes from *being* old, but you still spend all your time *getting* old.

"I should probably run over and talk to Raimbaut about some things," Margaret said. "Nice to see you again, Rufeu." She took off with the speed of an old friend avoiding Old Home Week with another old friend.

I stood and chatted with Rufeu for a long time, watching over his shoulder while Margaret, Raimbaut, and Laprada staged their tiff. Whoever the mystery guest was, he—

"Ebles Ribaterra!" Rufeu said.

It was so obvious a suggestion that I said "*Oc, ja,* of course," before I realized that Rufeu had said that because Ebles was walking in through the courtyard gate.

"I didn't even know the two of you were friends," Rufeu said.

"He has a lot to do with cultural affairs and in fact he's trying to arrange a tour for me with some of the new work."

"I don't think I've seen him since we were at court together," Rufeu said. "Well, really, I just came by to see you—I have a ski race tomorrow down in Ter-

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raust."

"You're still doing that, then?"

He hesitated. "Giraut, I've been in the planetary championships three stanyears in a row."

"*Deu*! How much touch can a *toszet* lose?" I said. "Rufeu, I am very sorry—"

"No, no. Don't be. The last time you and I communicated was four or five stanyears ago. Now I am going to go home and get the sleep I need for my race. And it made my heart glad to see you again, and see you doing so well. Old times, *companhon*."

"Old times."

The party had wound down into just a few people sitting around, passing around a lute, a guitar, and the remaining wine, exchanging bits of old songs and stories. Raimbaut and Laprada disappeared to one of the upstairs apartments. Margaret and Ebles, neither of them very musical, were sitting in the circle. I sat down next to Azalais, and joined the singing and playing for a while, but I was soon tired, and the heavy pressure of her head against my shoulder reminded me pleasantly of bed.

For singing-and-playing gatherings like this, I had settled into the comfortable habit of making my last song "Never Again Till the Next Time." The next time the lute came my way, I sang it, with Azalais supplying some soft harmony.

Since a "party take" is often very marketable, I clicked on my pocket recorder. Later, when Tech Services reanalyzed that recording, under the high note in the third line, they found the sound of a lock being ultrasound-probed.

I rose, helped Azalais to her feet, told everyone to drink and make noise as long as they wanted, and staggered off with her toward the master suite, which contained a two-person tub, alcohol scrubbers, a cold buffet, and satin sheets.

Azalais was being silly, pretending to be a rag doll and unable to move without my support. So she was walking in front of me, leaning backward to press her body against mine, her arms reaching back to encircle my hips, squirming her buttocks against me delightfully.

At the door, I said "Open."

The bomb attached to the other side blew a big piece of the door most of the way through Azalais, killing her instantly. Her body took the worst of the force, but my neck was broken even before the back of my head slammed against the opposite wall, knocking me unconscious.

Raimbaut and Laprada charged out into the hallway in most of some interesting underwear, weapons drawn and shouting an 888 call to the aintellects. I'm sorry I missed that part, but I'm glad I didn't see what they saw.

DEAR GIRAUT,

I'M SO SORRY THAT I GOT TOO BUSY AND MISSED MY WEEKLY PSYPYX RECORDING, SO I AM MISSING ALL MEMORY OF A GREAT WRAP PARTY.

OF *COURSE* I'M ANGRY. ALL THIS STINKS, AND IT IS A DIRECT RESULT OF MY ASSOCIATION WITH YOU, AND WITH EBLES. BESIDES, I FEEL GUILTY. TAMIANNE, WHO IS WEARING MY PSYPYX (AND IS ASLEEP RIGHT NOW) IS WORKING FOR THE OSP, SO SOON EVERYTHING I KNOW OF THE UNDERGROUND—EVERYTHING I PROMISED TO KEEP A SECRET—WILL BE IN OSP HANDS.

BUT I'LL GET OVER IT, *DONZ DE MI COR*. LONG BEFORE I HAVE MY OWN LITTLE FOUR-YEAR-OLD CLONE BODY WITH WHICH TO KICK YOUR SHINS, I SHALL HAVE FORGIVEN YOU.

TAMIANNE IS TWENTY-EIGHT, ONE OF THOSE RARE EARTH PEOPLE WHO GOES INTO THE BOX AND THEN DECIDES TO COME BACK OUT. THEY HAVE SOCIAL PROGRAMS, WITH COUNSELING AND WORKSHOPS AND GROUPS AND THINGS, TO HELP PEOPLE WHO WANT TO DO THAT, DID YOU KNOW THAT?

THERE IS SOMETHING BRIGHT AND BRAVE ABOUT TAMIANNE'S HAVING DECIDED TO TRY TO LEAD A REAL, FLESHLY, VULNERABLE LIFE. SHE WANTS TO JOIN THE OSP! SHE IS SO THRILLED AND EXCITED TO GET THIS CHANCE TO DO THEM SOME SERVICE, BY WEARING MY PSYPYX.

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FOR AT LEAST THE NEXT STANYEAR OR TWO, WE WILL PROBABLY HAVE TO COMMUNICATE TEXT-ONLY—TAMIANNE DOES NOT WANT ME TO RECORD MESSAGES IN THIS HOST BODY, BECAUSE SHE DOESN'T WANT ANYONE TO SEE HER THE WAY SHE IS RIGHT NOW. OF COURSE SHE'S HAD THE NANOS INJECTED AND IS BEING REBUILT RAPIDLY, LOSING TWO KILOS A WEEK, BUT RIGHT NOW SHE IS PINK, SCABBY, AND SORE ALL OVER AS THE PHAGES FIGHT ALL THOSE LONG-TERM INFECTIONS AND TIGHTEN AND SHRINK HER SKIN, AND SHE'S IN PAIN AS THE NANOS WORK AT RECONSTRUCTING HER LUNGS AND BOWELS, CEMENTING ALL THE MICRO-CRACKS IN HER BONES, REPLACING TISSUE IN DAMAGED ORGANS, AND CLEANING OUT HER BLOOD VESSELS. SHE LOOKS AND FEELS LIKE HELL—BUT SHE'S SO DETERMINED!

YESTERDAY WE TOOK OUR FIRST TWO-KILOMETER WALK, THROUGH A PARK, AND WORKED ON NOT MENTALLY CONVERTING IT TO PHOTOIMAGES. THE IDEA WAS FOR HER TO BE THERE WITH WHAT WAS THERE, NOT SLAPPING A MENTAL FRAME AROUND THINGS. SHE DID SO WELL! FOR AT LEAST A THIRD OF THAT WALK SHE LET HERSELF REALLY BE THERE, SWEATY AND FIGHTING FOR BREATH IN THE WARM, DAMP, LIVING AIR. SHE FINISHED IT TIRED, BUT SO, SO, *SO* PROUD OF HERSELF, AND MOVED TO TEARS, AS EXCITED AS A PUPPY IN A FLOCK OF BUTTERFLIES, BY THINGS LIKE THE SMELL OF THE FLOWERS AND THE WAY THE SUN REFLECTED FROM THE POND.

TOMORROW WE'RE GOING TO SPRING TO THE GRAND CANYON OVERLOOK.

SHE WANTS TO LEARN LUTE—WE'LL BE PLAYING THROUGH SOME OF YOUR TRAINING BRAINWARE—SMALL WORLD, EH?

I COULD ALMOST MANAGE TO BE GRATEFUL FOR A CHANCE TO SEE ALL THIS BRAVE, LOVING CHANGE HAPPEN TO ANOTHER HUMAN BEING.

ALMOST.

KEEP WRITING, *MI ENTENDENDOR*, AND MESSAGE ME AS SOON AS THEY LET YOU OUT OF THE TANK. I EXPECT PROPER BESEECHING FOR FORGIVENESS, AND PERHAPS A PROTEST OR TWO AT HOW CRUELLY I DENY IT TO YOU.

FONDLY,

AZALAIS

Azalais's letters were the best part of that very long stanmonth in the regen tank. While I itched and ached, froze and braised, in that syrup-filled coffin, the nanos welded my shattered vertebrae and cracked ribs; grew two good new kidneys next to my blood-leaking barely-surviving ones, then disassembled the old ones into amino acids; pulled microscopic flinders of smashed bone from the back of my brain and rebuilt my skull; restored every severed and damaged connecting nerve and led blood vessels and bone matrix to meet up and join precisely. Working from psypyx data, they restored my hindbrain, keeping what they could and replacing where they had to—which was quite a lot.

About a week into the process, they finished closing the cuts and replacing burned skin, so I could have phantom itches instead of real ones.

While they were at it, since it took no extra time, I told them to give me a facelift, restore my hair, clean out adipose fat from my abdomen, add some muscle tissue, put in newer tighter more flexible ligaments and tendons, and rebuild all my less-than-perfect joints (which was pretty much all of my joints, actually). I didn't have them take the gray from my hair. Since Occitans wear their true ages, I would wear fifty—there wasn't anything in the rules about what sort of fifty.

Azalais's daily letters, mostly about Tamianne's rediscovery of the real world were trivial, but long and fun. Dad's were rough drafts of a lecture series he was to give on economic pressures on literature in the ancient Western world. Paxa dropped a note to say that she was sad to hear that I was hurt, but saw no reason to begin corresponding when it could only be painful for both of us. When Rufeu won the Wilson planetary championships in springer-continued speed skiing, he dropped me a short note made up entirely of forty-year-old inside jokes, which I found hilarious.

Raimbaut and Laprada were gone for a few standays on a small side-mission at

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Chaka Home, on Quidde, that ended in some rough stuff against a ring of chimera-makers that had surreptitiously copied the psypyx of a Chaka Zulu Scout who had first distinguished himself in battle and then at a war crimes trial; they had implanted the copies, along with psypyxes of a star sales rep, and of a Houston-Minh Gang enforcer, into six clones of the all-Chaka Combat Decathlon champion (they hadn't tried to take that personality, since she was a gentle, spiritual sort).

The result was supposed to be a squad of super-killers in attractive female bodies. "They were all physically seven years old," Laprada said, shuddering. "Awkward-looking muscular little girls, charm like a kitten covering the basic life-view of a cobra. At least we know where they came from, who made them, what for, all of that, so we only had to DD one of them."

"Destructive deconstruction is so hard when you have to do it to a child," Raimbaut said. "Knowing they'll be going through that. Even if they cooperate and the techs are kind."

"The kind of tech who volunteers to do that," I said, "is not a kind person. And they're all volunteers at the advanced lab. Picturing them doing that to a little girl is pretty disgusting, but of course it's only the body that's a little girl."

Laprada laughed. "Easy to say. Raimbaut sort of forgot."

"They knew they were going to be anesthetized and never wake up," Raimbaut said, defensively. "And that one seemed to be really scared and sad, and she—it—just wanted a hug before the lights went out, and—well, they do look just like little girls."

He came forward and leaned against my tank, turning his neck to show it to me in the window. There was a fresh set of bandages. "It tried to bite through my carotid artery," he explained.

"Kittens and cobras," Laprada said. "You really should have known better."

I shrugged inside the tank, realized they couldn't see it, that I had done it with only my virtual body, and said, "Well, physical sympathy is one of those things that puts us above the aintellects. I'd hate to lose that."

"I thought you were treating aintellects better because of your promise to Paxa," Raimbaut said.

"Thanking them and not frightening them unnecessarily actually makes them work better," I said, "which in my situation of total dependence, makes a lot of sense. They're still not people. People have bodies, like you and me."

"And like vicious killer chimeras," Laprada said, "even though the bodies look adorable and just want a hug 'cause they're scared. A few million years of evolution were hitting Raimbaut's 'protect the women and children' button and it could have gotten him killed. And out of synch, and broken my heart."

Nowadays being out of synch was a whole new kind of disaster; if one member of a couple died, that meant re-starting in a four-year-old's body, two years later. This was why my parents disturbed people when they held hands in public—he apparently eight, she past eighty and UT so she couldn't just get another body. I could understand a healthy teenager body not wanting to cope with its true love being physically a child. "Well," I said, "Raimbaut is not dead, despite his best efforts, the chimeras are gone, and I still can't see a tender heart as something to be ashamed of. How was Chaka Home? I was only ever there for Shan's funeral." Quidde had miserably high gravity and insolation, and Chaka Home straddled its equator on an east coast. "Hot, humid, and heavy?"

"Hot, humid, and heavy covers it," Laprada said. "Apparently all that brain damage did nothing to your memory." She perched near the edge of the tank, leaning forward so I could see her face through the window. Don't ask me why seeing someone through a sterile plate

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feels better than seeing them through video, but it does.

"I can't imagine what it could have been like to be in a gun-and-laser fight in Quidde's heat and gravity," I said.

"Well," she said, "Whatever you're imagining, it was worse. And then having to deal with those child-shaped monsters afterwards. This was a mission you were lucky to miss, Giraut."

Their visit was the highlight of my time in the tank.

Weeks crawled by as I tinkered with the mixes of the Ix Cycle, until I reached a point where I couldn't seem to improve anything any further, merely playing with difference for difference's sake. I made my best-guess choices and sent a copy to Azalais for her notes.

Less than five minutes after I sent it, there was a reply. She could barely have heard the first song—I wondered what this could be about.

A fat woman I had never seen before, who must be Tamianne, appeared on the screen in front of me, and said, in Azalais's Occitan-accented Terstad, "Sorry Giraut they're here at the door and—goodbye and I—" The message ended there.

My heart was pounding and I was trying to scream and to punch my way out of the tank; normally you get used to letting your virtual body ghost over your actual one, but if you're upset enough you feel physically that you're in a coffin full of thick goo, not breathing, held by many clamps and pins, and that the screams are a spasm in your airless throat; the actual expression is picked up by the muscle readers and generated artificially, and over the speakers outside I could hear the flat mechanical *aaaaaa* of my attempt to cry out.

There was an emergency chime—incoming very high priority message—something I would never have expected to hear while in a regen tank. I had to force myself to feel the connection to my virtual body in order to take the call.

The screen revealed the most reassuring face it possibly could.

"Margaret, I just got a call from Azalais—"

"We know. We didn't get the door down, or block com, or grab her fast enough to stop her from getting off a message first to Ebles Ribaterra, and then to you."

My virtual face must have been the complete picture of confusion. "Someone was breaking into her apartment—"

"That was *us*, Giraut—three OSP agents and a fire team of CSPs. We went in there to rescue Tamianne Tschwann, seize the entity calling itself Azalais, and prevent it from self-destroying before it could be captured for interrogation."

"It—?"

"Azalais—or the thing you thought was Azalais—is a chimera, Giraut. We don't know any of the who or what or how about it at all. But Tamianne is now safe from it, and so are you, and I'll get back to you just as soon as the scientific team knows anything."

She clicked off, leaving me alone in the tank, with nothing to do but try not to feel the restraints and clamps, try to let the virtual feeling of a clean hospital bed overpower the terror of the thick gel encasing me and filling my lungs. The aintellect asked if I wanted to be sedated, but I wouldn't take it, waiting for Margaret's call; so instead the aintellect talked to me, distracted me, as if I were a child in an emergency room, and it were my mother.

It was five very long hours before Margaret called. Part of my mind was still waiting for all the noise to be over, so that I could hear what Azalais thought of the final version. Another part was trying to say "There is some mistake here." Yet another was merely lost in stunned nausea.

Why had she called me to say goodbye? I understood why she had called Ebles—he was probably her lover and definitely her controller.

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At last the com chimed and it was Margaret.

"Hello," I said. "What are you going to do with her? And how could she even *be* a chimera? I *knew* her."

"Oh, she's a chimera, all right. We had to wait to get some psypyx copies made, but once we could do preliminary work on one of the copies, we found out that being a chimera wasn't half of it. She's one of the strangest beings ever to turn up in an OSP investigation."

"But she was—when I knew her when she was younger—"

"You have to remember that you knew her about thirty years ago, Giraut. This isn't like other cases. Usually when we arrest chimeras, they're not done merging. Often they've barely begun; we're lucky that the chain of crimes needed to make one tends to be very visible, and we usually catch them early. But the preliminary exam of Azalais showed no boundary between the original personality and the added one—this was the oldest and most integrated chimera we've ever seen. But that's not the most shocking part." Margaret leaned forward toward the com screen and said, "The other half of Azalais wasn't human. It was an aintellect."

My face on her screen must really have been something.

"It's true," Margaret said. "The first aintellect-human chimera. No one would have thought that could happen; we thought aintellects found all flesh disgusting. The idea that one would cross over—let alone merge—well, we're going to learn a *lot* from this, but right now we haven't—"

"What are you going to do with her psypyx?" I asked.

"We've already sent its psypyx over to OSP Advanced Research. They will run off some copies and start destructive deconstruction—we'll get everything out of her eventually."

I felt something cold and slippery, with sharp little feet, clamber down my spine and plaster itself across my tailbone, and it must have shown.

Margaret's eyes were soft and gentle. "Giraut. As a friend. Don't think about this too much and don't blame yourself. You had sex with a warm body operated by an aintellect with some stolen memories. Like a humaniform robot, the kind they sell in Freiporto for sadists to torture and kill—and you know, some of those have bits of kidnapped psypyx in them, to make them more real. Millions of men buy them, where they are legal. You're only *accidentally* a pervert—"

"It's not that! Margaret, she was a person, and she's going to go through DD—and I've met some of the people who work in Advanced Research and they are *ghouls*—they brag about how destructive deconstruction feels like being burned alive for years, subjectively—"

"Oh, the virtual body is only attached to the psypyx if the research subject doesn't cooperate. Otherwise it's quite painless, they just keep asking questions, snap-shooting all the memories that engage when they ask the question, and then erasing those memories and asking more questions, to get to the answers under the answers. If the experience is like anything, they say, it's like having a perfectly healthy, pain-free body and going through a planned-and-directed Alzheimer's till there's no more you." Margaret must have seen something in my face. "Giraut, I adore your silly sentimental side, but you can stop indulging it right now. There *was* no Azalais, not any more, hadn't been one for decades. The Azalais you knew was just one ingredient in a chimera. That's all.

"And there isn't any real pain—by definition that thing won't remember anything afterward. The only reason the OSP emphasizes the pain of destructive deconstruction is to keep our own working aintellects afraid of it. She—there, see, I did it too—*it* won't be in any pain if it cooperates. And we'll just

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take apart the one copy; the rest will be kept on file in case we need her testimony in Secret Court, or for any further research or experiments they want to do at Advanced Research, but as long as the chimera just answers questions—"

"That one copy is a person!"

"Azalais was no more a person than a psypyx sitting on a rack waiting to be implanted—"

"Margaret, you and I went on a bloody raid and plotted a coup and nearly plunged human space into war to assert that an unimplanted psypyx on a rack *is* a person. Shan *died* for that. Azalais lived and loved and made art—"

"Because it had the memories of a real human to guide it, and it was living in a body you could interact with. Not because it was a person. It could easily pass the Turing Test, of course. But then so could billions of aintellects going back the last five centuries. It is *not* a person. No court would find that it was, and no human philosopher would think so."

"May I have some time alone before we go on?" I squeaked out.

"Giraut, I'm sorry that I upset you."

"I'm sorry, too, I don't know why I'm so upset," I said, lying, and clicked off.

Of course I knew. I had *liked* Azalais.

I tried to tell myself that I had liked my memories of her as a young girl, before she had merged into a chimera. That was foolish. An *entendendor* and an *entendendora* worship each other, but they don't know each other. If I had never seen her again, she would have been like an unusually pretty face in pornography or a sweet voice on a recording you encountered long ago—a memory of desire, not of someone I had known.

No, this was *not* about my vague, hazy images of a pretty girl on a long-ago beach, or her light hand resting on my teenaged arm while I drank and bragged and looked around for a fight in Pertz's.

I felt exactly what I had felt every time I lost a good friend to real, permanent death: that same wrenching awareness of folding up a part of your heart to put in the drawer, with the other keepsakes, because that part is for the living, and you won't be needing it ever again; the moment when you look at that piece of your heart, now soft, sad, dark and empty, one last time before the drawer thuds shut.

And I felt that for Azalais, not for my decades-old memories of the girl that she had been.

She had been an enemy spy.

She had been a preposterous monster.

She had been beautiful and tender and talented and had liked me and wanted to be with me.

Now they would take her apart.

For some reason we didn't know yet, the other side had thought it worthwhile to risk using a chimera in the operation, and when she had been accidentally killed, she had awakened in the mind of a candidate OSP agent. Such sheer cool nerve—her very thoughts bare to her deadliest enemies, trapped in an all but immobile body with an enemy agent, and boldly trying to bluff her way through two years.

That she had managed for a single month was quite an accomplishment. I was proud of her.

Though I knew the crime should disgust me, I could feel no disgust about Azalais, no burning desire to be avenged on her; only terrible grief. I would miss her so.

No matter what Margaret said, it had been Azalais—a person named Azalais—who had written me a long letter about Tamianne's first walk on the beach at sunrise, a letter I had received just that morning.

I wished I could com Tamianne, and we could talk about Azalais together.

After a while, I called up a recording Azalais had made, before I knew her, but long after she had been made a chimera. It was her performance of the Nakachi-Jones *Two Cellos and Voice* suite; she had recorded both cellos and the voice,

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purely as a show-off piece. That piece had always seemed a bit bathetic to me, and I had admired the way Azalais gave it a restraint it didn't naturally have.

Now, it just didn't seem sad enough.

A few days later they let me out of the tank and I could finally scratch all over, take a shower, and experiment with breathing real air and tasting real food. You come out of regen with better muscle tone and skin and so forth than you went in with, so you're actually healthier, but it takes a little time for the nervous system to get reacquainted with non-phantom input, and to understand that it is running the show again. They told me to take a few days and sort my feelings out.

I went back to Noupeitau. My stuff hadn't been moved from the rented house, and besides, all my friends were there—that is, a few old school acquaintances, and my team.

Nobody would be asking about Azalais. When someone's disappearance is OSP-connected, they just don't.

When had people gotten to be afraid of the Council? When I was young it was one of those things like the Red Cross that people knew might not be very effective but had its heart in the right place.

I badly needed to talk with someone.

For a good symbolic place for a transition in your life, go to a beach. The sea meets the land, and generally you can also see the sky meeting the sea on one side and the sky meeting the land on the other. So there you are among all those boundaries, right at the place where life climbed out of the sea. It has lots of distance for staring off into. For me, beaches always swarmed with past loves and past moments, vivid memories surfacing from the water and storming inland like movie Vikings in their horned helmets and scuba gear, waving their battle-axes and tommy guns.

(Well, all right, that's a scene from *Admiral Nelson on Iwo Jima*, but every former fourteen-year-old boy knows that after two centuries that's still the best Viking movie ever made).

And much as it is for movie Vikings, the beach is a place where the memories can storm around, make a great deal of noise, look threatening with a lot of style, and do little actual harm—a free range for metaphors.

Also a beach is one of the hardest places to bug. There's a huge white noise generator always running, dunes to wander behind, and few good places to hide a microphone, and you can stay in constant motion.

Raimbaut, Laprada, and I were taking a slow walk south along Platzbori, back toward the city. The blood-red dot of Arcturus had set, but the sky was still bright pink. A handful of the very brightest stars were visible through the soot.

Raimbaut perched on rock and got out the big flask of red wine from his pack. Laprada and I accepted glasses. I held mine up. "Another round for humanity—"

"And one more for the good guys," they chorused, and by common consent we drank off that toast, complete, and refilled the glasses. Platzbori was softer in the mist. Noupeitau, far off to our left, glowed like foggy magic with just the tallest towers and spires sticking out. It was a good, warm, secure place to be.

Raimbaut and Laprada had their arms around each other, and I hoped they appreciated how lovely that must be. I sat down with my back to the rock, facing toward the sea, so that my friends' feet were dangling just above my head. And then, without really having thought of it beforehand, I just blurted out, "I don't seem to be able to attain any objectivity about Azalais, no matter how much I think about what she was."

When I finished talking, Raimbaut leaned far down to speak almost into my ear and said, "Hold up your glass, compañhon, that's right, over your head. It's empty."

His hand grasped my wrist—I could-

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n't help noticing how young and strong his grip felt on me—and I felt the gurgle of wine through the stem of the glass. "There you are," he said.

I brought the glass carefully down to my head level and sipped.

"Giraut, it must have been dreadful," Laprada said. "Like waking up and finding yourself having sex with your mother, or the dog. You've got to stop thinking about it."

There was a very awkward silence, and then Raimbaut sighed. "Laprada," he said, very softly, "I don't think that's what the matter is with Giraut."

"I was trying to give him the benefit of the doubt. All right, so Giraut feels bad about that chimera because he misses the nice body that it stole from his old girlfriend, along with her memories and mannerisms and so on. Some old philosopher said that a lot of men fall in love with a pair of shoes and marry the whole woman to get them. This is the same thing with fancier shoes. And being able to fall in love with something like *that*, just because it held your hand and laughed at your jokes and played the cello and was all cuddly, is *not* a compliment to women."

After a bit, we found a public springer about two hundred meters from those rocks, and sprang through to the one just across the street from Pertz's, so that we more or less walked straight off the beach, across a cobblestoned street, and into the old tavern.

I paused at the door, all the same, as if there were a great crowd in the doorway in front of me. If Azalais hadn't made the completely amateur mistake of liking me—

I noticed Raimbaut had stopped beside me, and raised an eyebrow. He shrugged. "Just thinking about all the changes that came and went through that door. Pertz's is a place for nostalgia, and we're about to get drenched in it."

Pertz's eyes didn't meet mine. He knew I had something to do with Azalais's disappearance. He was a sentimental old man; it didn't help that he was also right. And when had the good guys started frightening honest, kind old tavern keepers?

But I pretended not to notice, since there was nothing else to do, and we ordered a Pertz's Starving Artist Special to share—big bowls for the table of chili, chapatis, and pickled herring, with a pitcher of sweet clear Caledon apple wine to wash it down, and took a table in the back.

Raimbaut looked up from his chili to say, "Hel-*lo!* So Pertz finally found a vu of Marcabru."

Our old *companhon* glowered at us from the Wall of Honor; from the puffy face and the look of stupid rage we knew the vu had been shot after Marcabru's term as Prince Consort.

"He's not like I remember him," I said.

"Nor me," Raimbaut said. "Not like I'd choose to. It's really being a Pertz's night, isn't it? Old friends sharing old jokes and remember-whens, and wondering why the world keeps changing so fast."

"Not much ever really changes at Pertz's, I suppose. Now all we have to do is wait for the King to walk in, or someone to draw an epee, or—"

The com chimed. "Who?" I asked the aintellect, my eyes still locked on Raimbaut's.

"Margaret Leones, official business, very urgent."

"What are you all laughing about?" she demanded, when I answered the com a moment later, and told her where we were and who was with me.

I explained and she gave me a grim little smile, the expression of someone who is expecting an argument. "Well," she said. "I suppose this will fit the pattern. We need something urgently from you, Giraut, and I could order you to help, but knowing how you are apt to feel about it, I hate the idea."

"But you will if you have to?"

"I will. The first DD of the Azalais psypyx didn't work out. It will help the

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team in Advanced Research, when they start the next destructive deconstruction, to have acquaintances of the subject present. We thought that perhaps you and Tamianne Tschwann—"

"Margaret, don't make me do this."

"—would be able to assist, and chances are, I admit, it will make no difference, but this is one of the biggest, strangest cases we've ever had—"

"Margaret, can't you just respect my feelings this time?"

"—and I'd be neglecting my duty if I didn't at least try any method that has been known to work in the past."

She kept rolling; I kept protesting. Margaret doesn't usually ignore the other side of a conversation. When she does, it's because the conversation is not a conversation, but a set of orders wrapped in a polite fiction.

I was about half undressed for bed when Raimbaut tapped at the door. "Giraut?"

"Ja, mi companhon."

"All that wine is causing headaches. Laprada is taking hers to bath and bed, I was going to take mine down to the end of the pier to breathe some sea air. I wouldn't mind company."

"Well, I'd rather take a bath with Laprada—"

"I heard that," she said, loudly. "Some of us have other preferences."

I was already re-dressing, actually. "I'll be out in just a minute," I told Raimbaut.

With modern scrubbers, there's no such thing as an alcohol headache; two pills and two big glasses of water to cope with the dehydration, and in about ten minutes you pee like a horse and you're sober and comfortable. So it sounded to me like Raimbaut thought we had some things to talk about.

When I emerged, he handed me my rain-*tapi*, and he already had his on. "Light spitting rain out there," he said.

Actually it had crossed the boundary between a spitting rain and a pissing rain. Perfect; another white noise source to blur the sounds.

The edges of the pier glowed a soft safety yellow. We walked all the way to the T-shaped end, almost a kilometer, swept our tapis under us so that we could sit on them in the rain, and sat and looked at the dim, blurry harbor lights for a while before Raimbaut finally said, "I know you, *mi companhon.* Your heart is breaking. And when I think of Azalais as a person, I understand why. "

"Do you think of her as a person?"

"I find it hard to think of her as a chimera."

"Well," I said. "When a thing is a person only when it's convenient for it to be . . . something's wrong, someplace. We want to find and rescue Shan's illegal psypyx because we don't want Shan to be DD'd, helpless and in horrible pain that lasts effectively forever, but we are doing the same thing to Azalais, and she will have to do the same dying and suffering. But Margaret is already referring to Azalais as 'it.'

"I *liked* her, Raimbaut. I suppose at heart I'm one of those people that our philosophy teacher, back at St. Bawdy's, used to tear into. What was his name?"

"Puebuscin. Mihel Puebuscin. The one who wrote the moral denunciations of your early compositions."

"I'd forgotten that. Serious bastard, wasn't he? And tin-eared besides. Remember how he used to shout at us that most of the trouble in the world was caused by people who couldn't tell the difference between 'my team' and 'the good guys'?"

"Normally, Giraut, I'm one of those people he was yelling about. Normally I just trust all my friends to be on the right side. But . . . well, I really liked Azalais, too, you know. And I don't see why she has to die in horrible torture, either. The whole idea of a human-aintellect chimera is weird and feels terribly wrong to me, but Azalais was not an idea." He threw a little chip of something off the dock out into the bay; it splashed but the water was too churned

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by the rain to show ripples. "Remember how Aimeric always said you were a bright enough *toszet* where women weren't involved? Laprada and I had a bet down, after Paxa left, about how soon you would fall in love again."

"Who won?"

"Laprada. She guessed too long by two weeks, I guessed too long by five."

Gratz'deu, I laughed. Then we talked about the strangeness of life, and many, many days and friends gone by, until finally, stumbling from sleeplessness, we made our way back up the pier and I slept until mid-morning.

When I awoke, I was still miserable, but I was at least able to say I would face a clear duty; I commed Margaret and agreed to go with Tamianne to Advanced Research and talk to Azalais's psypyx, four standays from now.

For today, there were long streets to walk with my friends, notes to make for future sad songs, and time to sit by the sea and just think. That evening, as I walked through the market, a busty redhaired woman smiled and said hello, and I wondered what bets Laprada and Raimbaut had down, now.

Tamianne was quiet and looked tired; the robot showing us through the Advanced Research facility asked if she was all right. She grunted with the effort and said, "It's just been a long day and a long walk for me. In another few months this wouldn't even be noticeable."

"I've admired your courage for a while," I said.

"I know Azalais wrote about it. I think she was overrating it. It's the courage of a cornered rat. I was bored beyond all measure in cyberspace, and the only thing I did when I wasn't in cyberspace was eat, and once you start to realize that you've given yourself a life sentence that's like death but more boring . . . well, here I am. Every time I think about how much I don't like being Tamianne Tschwann, all I have to do is think about spending another decade being Princess Belle, Layla the Elf Queen, Pirate Nell, or Dale Evans, in rotation. You haven't been bored till you've led a boarding party in bad chop and noticed that everyone in both crews is yawning while the cutlasses clang, or been gang-raped by ten rustlers who would all rather be getting a beer and a nap, and not felt like it was worth the bother of pulling the knife out of the boot to gut the biggest one."

"What's a rustler?"

"A bad guy in the Dale Evans world. Which was put together from some Old American film. Though I bet in the original her horse Buttermilk didn't talk or fly."

"Well," I said, smiling because I realized that I was going to like her just as much as Azalais had thought I would, "when you put it that way, why doesn't everyone flee the box?"

She shrugged. "*I'm* not going back in to ask them."

"I am instructed that both of you have some emotional attachment to the subject," the robot said. It looked like a garbage can on tank treads, or an assault vacuum cleaner. "I was therefore requested to request of you that we be allowed to brain-monitor you while you talk with the subject. We would like to study how a chimera was able to win the friendship and loyalty of two human beings, and it will be useful if we can compare a running brain-read from you with the communications of the subject."

"She did it the same way that any human being does," I said. "She was warm and personable and someone I wanted to know."

"That's exactly what I would say," Tamianne added.

"Interesting," the robot said, meaning it wasn't. "May we install the brain monitors on you?"

I shrugged. They use the same sockets that are used for psypyx recordings, and you don't feel it at all; it's just a tiny chip on the back of your head, under

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your hair. I'd been brain-monitored during many ops. "Go right ahead," I said.

"I *am* interested," the robot added.

"I assumed you weren't lying," I said.

"Thank you, sir. I do have choices about telling the truth—those are essential for my occupation—and it is pleasant to be trusted."

"You must have a highly specialized emotional configuration, considering that more often you're ripping up aintellects rather than humans. You would need empathy but not sympathy, I suppose."

"Just so, sir. I do feel their pain, with the highest degree of imagination with which a machine can be equipped. But I feel it as pleasure; only the repudiation of a lie is more exquisite to my emotions and sensory system."

Tamianne looked sick and I felt worse than she looked.

In the workroom, they seated us into comfortable chairs, inserted monitors into the sockets in our heads, and ran a signal check. The small delivery springer on the table glowed gray, and a psypyx case, about as big as a flashlight, came through. The robot extended an arm with a forceps grip, opened the psypyx case, and put the psypyx into a player.

What causes that strange hum that all machinery seems to make when it is just about to do something?

I had a shaved moment to realize that the hum was *not* coming from the psypyx reader, and to look to my left. The emergency exit springer had begun to glow. The robot pivoted and said "What—" before a projectile put a big hole through its center.

When I looked back, Ebles Ribaterra was standing in front of the springer, in a plain black uniform, pointing a maser at me. Men in the same uniform rushed through into the workroom behind him. Before I could quite draw breath, one of them had sealed the door with spray plastic, and another had grabbed the little supply springer, through which Azalais's psypyx had just come, from the desk and clamped a reader to its control box.

"The male is trained," Ebles said.

Two of his commandos stepped forward and took up positions, each on either side of me, not symmetrical and clearly waiting for me to move so that they could bash me. "I'll be good," I said.

"Of course you will. My friends are standing over you."

Another commando looked up from the supply springer. "Got the address, sir. Loading to the floor springer—it's in."

The two commandos guarding me stayed where they were; everyone else dove back through the emergency springer again. I wanted to ask questions but it didn't seem like the time. I guessed that the home team was not winning.

After a very long pause, Ribaterra and his team returned through the springer. "Recheck. Compare to inventory, are we just missing the one copy?" he said, out loud.

An aintellect voice said, "That is correct, and it should be in the room where you are now."

I'm not sure how many times in a long life I have found myself reflecting, for years after some brief incident, how much changes in a few seconds. The opponent you almost beat to the punch, who lands a good one; the moment when a possible lover asks an innocent question that is actually utterly putting you to the test; the second when everything depends on your nerve, and you do it or you don't. I am more aware of such moments than most people, perhaps because I have had so many; or maybe I remember so many because I am unusually aware of them.

This was one.

Ebles looked at the empty psypyx case on the table. Then he glanced at me—probably only looking to see if I might have the psypyx on my lap or in my hand.

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I deliberately looked at the loading door on the psypyx reader, nodded at it firmly, and made eye contact with Ebles. He looked astonished, of course; then he smiled and pushed the emergency eject. Azalais's psypyx popped out into his hand, and he dropped it back into its case.

"Mission accomplished, evacuating," he said. "Go."

His commandos tumbled through the springer, back to wherever they had come from, with speed and efficiency that would have gratified me if I had seen it in *my* team.

Ebles went last—the commander's privilege. "Tell your Section Chief that she's a great kisser. And you and she both ought to think about joining us. *We* never leave an agent behind."

He stepped into the sheet of glowing gray and was gone.

Margaret was holding her expression flat. "Giraut, before we even begin to talk, let me point out that you were being brain-recorded, so there's no point in lying or shading the truth; we know what you were thinking and feeling at every point. Is that clear?"

"It's clear."

"Good, then. We know you pointed out the location, to Ebles Ribaterra, of the very last copy of that chimera—don't try to make me use its name—and we are of course aware that they might have found it and gotten away anyway; you may have only made a difference of a few seconds, but in those few seconds a CSP team was getting ready and we were about to retake command of that springer. We might have captured a half-dozen extraterritorials—who very probably knew a great deal of value about their military and security systems—and retained one copy, which would be all we needed, of that chimera. You turned the possibility of a stunning victory into utter defeat, you did it deliberately, and now I would like to know why."

"The brain recording ought to show that I didn't premeditate it," I said. "It was the OSP, not me, that decided I needed to be there to talk with a good friend while you tortured and destroyed her. It was the OSP's, not my, security breach that let them find out the exact second at which to strike. It was—"

"I really ought to order the Ix Cycle suppressed, all copies destroyed, and you confined. For good."

A long awkward silence. I just stared at her, trying to make her words fit with the Margaret I knew.

There's an old saying in negotiations; after the deal is on the table, the first one to talk loses. After a few long seconds, Margaret drew a breath, looked down, and said, "That was anger talking. I won't. Yes, we know the lapse was momentary. We also know you don't have any regret for having had it. You really do see that thing in the psypyx as a person."

"Yes."

"And you acted to save what you thought of as an innocent person. We know that too."

"Yes."

"Will you consent to another brain read, so we can find out what your loyalties are?"

Something about her posture, or her expression, or her tone—I can't really say, but it seemed nearly like telepathy—screamed *say yes.* So I did.

They found me "loyal with reservations"—the category they use for Quakers, Gandhists, Reconstructed Vegans, and so forth, who are allowed to work for the OSP but only in capacities where their moral objections don't pose a problem.

It was a pretty strange thing to discover that at fifty I was a conscientious objector, but "at least you know you have a conscience," Raimbaut said to me, as we watched the bloody period of Arcturus sink into Totzmare, and the black rocks around us fade into the darkness. "That's more than a lot of us know." ■

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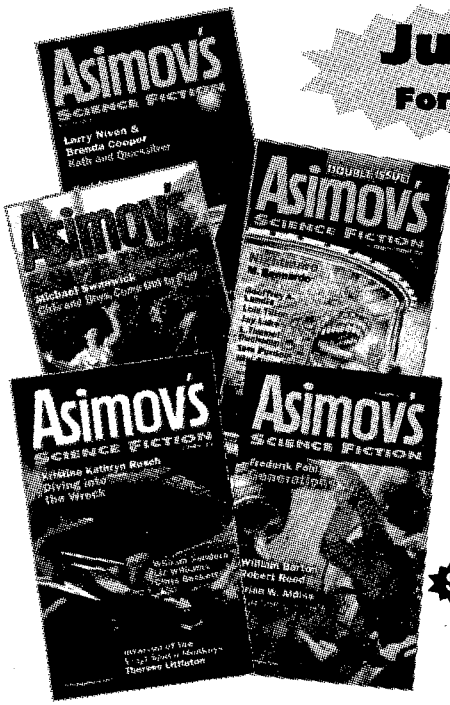

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"Treasure" immediately conjuers up certain images—which may or may not be the right ones.

Sun of Suns
Part III

Karl Schroeder
Illustration by George Krauter

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The story so far . . .

Imagine sky with no earth: clouds dot the blue, receding to infinity in all directions. To one side a distant sun casts its light across hundreds of miles, sending shafts of shadow radiating from the clouds that surround it. Opposite it, the blue fades to black. There is no gravity here—rocks twirl and balls of water undulate in the chill air. Spinning in the middle distance is a wooden wheel two hundred feet in diameter, its inside surface paved with buildings. And inside one of these buildings, young ***Hayden Griffin*** *is sulking.*

Hayden is oblivious to the strange beauty that surrounds him. He's lived his whole life here in Virga and is unsurprised at a world where you have to make your own light, heat, and gravity. Virga is a fullerene balloon five thousand miles in diameter, filled with air, tumbling rocks, and water—about a Pluto's worth of volatiles. This artificial habitat orbits alone in the outskirts of the Vega star system; but Hayden knows nothing of that. He's spent his entire young life focused on the political struggles of his own nation, Aerie, in its fight against invading forces from the migratory country of Slipstream.

Hayden's mother is part of a secret project being undertaken here on the edge of darkness. She is part of a resistance group fighting for Aerie's independence. Since Slipstream destroyed Aerie's nuclear fusion sun ten years ago, Aerie has been utterly dependent on Slipstream for light and heat. An engineer, Hayden's mother has come here to the cold edge of Winter to build a new sun for Aerie.

An ominous note enters the ordinary day: it is the sound of approaching jet engines. Hayden runs outside in time to see a fleet of Slipstream warships approaching. The secret project has been discovered. Soon the air is full of snarling jets, each can-shaped engine surmounted by a saddle and gun-toting rider. Dogfights surround the town and the glittering, half-built sun floating a mile away. Determined to help his mother and the resistance, Hayden impulsively mounts one of the town's jets (which are called bikes) and dives into the conflict. He is too young to control the massive bike, however, and it crashes into an approaching warship.

As Hayden spins helplessly into the unlit airs of Winter, he sees the new Aerie sun explode, with his mother inside.

Time: eight years later. Place: the city of Rush, capital of Slipstream. ***Venera Fanning****, wife of the admiral of Slipstream, enters the ladies' lounge of the admiralty, leaving her manservant outside. This is one of the meeting places for the spy network she runs. The men she meets show her some photographs that indicate a military buildup in the neighboring nation of Falcon Formation. Disturbed, Venera goes to warn her husband.*

Her manservant is none other than Hayden Griffin. He has infiltrated the Fanning household with the intention of killing ***Admiral Fanning****, whom he blames for his mother's death. Despite his determination, he keeps finding reasons to put off doing the deed.*

That night, there is a sneak attack on Rush while Hayden is wandering the streets of the city. Another of Slipstream's neighbors, Mavery, is blamed—but Venera and her husband Chaison know that Mavery is conspiring with Falcon Formation. The trouble is, they can't convince the government, which has decided to send the Slipstream fleet into Mavery. With the fleet distracted, Falcon will mount an attack on Slipstream. If they are to save Slipstream, they will have to do something themselves—something audacious.

While husband and wife debate, Hayden sneaks up to their office, knife

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in hand. But at the crucial moment, he is unable to act. Venera sweeps out of the office and, spotting Hayden, orders him to get his things together. They are leaving tonight. Paralyzed by indecision and doubt, he dumbly nods before retreating in shame and frustration.

So it is that the next day, Hayden finds himself boarding a Slipstream cruiser behind Venera Fanning. As they leave Rush to great fanfare, he meets some of the other members of the expeditionary force. One is the ship's go-fer, the weasel-faced boy ***Martor****. Another, the new armorer, is a beautiful young woman named* ***Aubri Mahallan****.*

Seven ships, led by Admiral Fanning's, break off from the main group. Despairing and mystified, Hayden watches as the sunlit realms recede. He, the Fannings, and his new crewmates are headed at full speed away from Slipstream, away from Mavery, and away from Falcon Formation—and into the fathomless darkness and cold of Winter.

Venera has hired Hayden as a driver, so to keep busy he decides to shake down the bike she's supplied for him. With Martor in his sidecar, he eases out of the Rook's *hangar and into the blackness of Winter. He doesn't want to think at this point; any action will do to keep himself from contemplating his situation.*

He takes Martor on a ride through the clouds. We've seen glimpses of the skies of Virga, but now the heavens open up and though it's dark as night, a deep indigo glow leaks in from all sides, illuminating clouds, balls of undulating water, and occasional drifting rocks. Hayden takes the bike up to two hundred miles per hour and they easily outpace the seven ships of the expeditionary force.

It's lucky that Hayden does this, because as he's arrowing ahead of the expedition, he suddenly sees a reflection of his own headlight gleaming back at him. He stops the bike just in time to avoid running into a wall of dark water—but isn't quite fast enough on the horn to warn the rest of the ships. One of them, the Tormentor, *plows right into the miles-wide ball of water that's drifted into their flight path.*

As the airmen dig the Tormentor *out of the quavering water, somebody spots lights shining in the depths of the teardrop ocean. Hayden lets slip that he knows what this place is: during his exile in Winter he'd heard of the town of Warea, which is situated in the hollowed-out heart of a giant ball of water. When Admiral Fanning learns that he's familiar with the place, he orders Hayden to join the small group going into the ocean to negotiate for supplies to repair* Tormentor.

Hayden seizes the opportunity to send a message back to the resistance in Rush. As a result of this, he will have cause to wonder whether he is the cause of the catastrophe that follows.

Repairs complete, the ships continue on their way. Hayden and Martor get to know Aubri Mahallan, the ship's armorer, as she gets them to help her with some odd electrical devices she's building. It turns out that Mahallan is not from Virga, but is a visitor from the strange universe outside the giant balloon. She doesn't like to talk about her past, though—and as a man with secrets himself, Hayden doesn't press. But he finds himself powerfully attracted to her.

A few nights into the voyage their conversation is interrupted by the onset of a strange phenomenon: a very faint gravity is being felt by the ships. Their engines labor as they pass near the skin of Virga itself. This is a region of giant icebergs that cling to the subzero skin like icicles. They have come as far from Candesce—the giant Sun of Suns that reigns over the core of Virga—as you can get. Beyond those icebergs lies vacuum and the strange civilization of Artificial Nature, Aubri's

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home.

Fanning has brought them here to visit something Aubri calls the "tourist station"—some sort of settlement of visitors from Artificial Nature. Poking his head out a porthole, Hayden can see its lights twinkling in the distance.

Suddenly rockets streak out of the darkness. The expedition is under attack. In the chaos that follows, the ships are separated as black-hulled pirate vessels loom out of the mist. Both the pirates and the Slipstreamers spew mines into the air in an attempt to limit mobility; but the pirates have the advantage of knowing where the icebergs lurk in the cloudbanks. Their ships soar out of the mists, fire off a salvo, and retreat before the Slipstreamers can line up on them. And they outnumber Admiral Fanning's ships.

Hayden sees that things are going badly. He tries to convince Aubri Mahallan to escape with him; on his bike they can make it to the tourist station easily. She rebuffs him, displaying surprising loyalty for her Slipstream employers. Hayden has no chance to run in any case, as Fanning sends him out to clear mines instead. With Martor's help he succeeds in blowing several icebergs away from Virga's skin and two pirate ships collide with one. But meanwhile the Rook is being boarded.

*When Hayden tries to leave the struggling ship behind, Martor knocks him out and tries to fight off the pirates single-handedly. But it's too late. He, Admiral Fanning, **Carrier**, and Fanning's aide **Travis** end up locked together in a cage aboard the Rook. Venera, meanwhile, has shot the Rook's captain to keep him from firing the ship's scuttling charges. She too is captured and abused by **Dentius**, the pirate captain.*

The prisoners talk to pass the time. Fanning lets slip that the expeditionary force has not come here to Winter to fight Falcon Formation—at least, not right away. No, it turns out that they came to the tourist station to retrieve a map—a map that may lead to a fabled hoard of pirate's treasure.

He has no time to explain further as the pirates come and open the cage. It is time, they say, for the executions.

10

"This will be a truly grand spectacle!" shouted Captain Dentius. He had his feet hooked into two leather straps on a T-bar that surmounted a long pole. The pole had been thrust out the side of the *Rook* so that he stood outside it, in commanding view of both his own ship and the *Rook*. Two of his lieutenants were similarly perched, and tied to the crosspiece by their wrists were Venera Fanning and Aubri Mahallan.

"It's a tradition of mass executions to sail into port leaving a trail of blood in the sky," said Dentius to his audience. "But that only works when you're near a sun. It's the visibility that's important, you see—justice must be seen to be done, eh?" He looked down at Venera and grinned. The grin had the intense focus of a man who's on stage and acting a part.

"So," he declaimed, "we pirates of Winter have invented an alternative method. Rather than tying you all to the outside of your ship and riddling you with bullets, or slicing your arteries with knives and then flying into port trailing a grand banner of blood . . . rather than that, we choose to announce our executions with *fire*."

"Dentius, please," murmured Aubri. "You won't lose face if you spare these men. It—"

"Silence," he hissed at her. "I've already lost face." He turned back to the vista of the rope-twined ships. The portholes and hangar doors of the pirate were wide open, and everywhere lanterns were aimed at the *Rook*. The bright light obscured whatever waited in the darkness; it was as if only these two ships existed in the entire universe.

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As far as we're concerned, Venera thought, *that might as well be true.*

The crew of the *Rook* were tied in nets that trailed behind the ship on long ropes. Three pirates carrying a bag of kerosene and a mop were moving systematically around the nets, slopping fuel over the men of Slipstream.

Venera had also asked Dentius to spare the men—not that she'd begged; he might have felt he had leverage on her if he thought she cared overmuch for them. And she didn't, of course; but one pair of eyes glaring up at her from the bullet-scarred hull of the *Rook* belonged to Chaison. He had survived and his men had not given him away. Both facts impressed Venera.

"Have you considered that some of these airmen might make good converts?" she asked now.

"They're Slipstreamers," Dentius said. "The original pirates. You execute pirates when you catch them, you know."

It was humiliating to be tied at the feet of these odorous maggot-colored men. She'd see them dead as soon as humanly possible. The thought cheered her somewhat, until she glanced back at the tangles of bodies hanging from the *Rook*.

Would her plan work with the degree of uncontrolled fire that was likely to be trailing the *Rook* in the next hour or so? She somehow doubted it; after all, if she played her hand now Dentius could always belay the fire and have the Slipstreamers shot instead.

She almost opened her mouth anyway to give Dentius her ultimatum—but he was addressing the crowd. "We will be rendezvousing with the rest of our ship within the hour," he shouted. "We've seen their semaphores blinking in the night air. The little Slipstream fleet has been utterly destroyed. To celebrate, as we sail into formation with our brothers, you will light our way. And your smoke will trail behind us for a hundred miles—two hundred miles!" His men cheered and Dentius raised a fist.

Dentius had come to her last night, and she'd submitted to his dark attentions. Venera's revulsion for the man had reached an almost religious pitch; she hadn't felt such intensity of emotion since the bandages were removed and she first saw her scar in the mirror. Yet she'd known he was waiting for her to try something. He would have happily taken the pretext to kill her, she knew. So instead of reaching for a hatpin or the comfortable heaviness of her jewel box, she had lain there and listened to him talk. He was a man crushed beneath the weight of his own history.

Dentius had once been a captain in the Aerie navy. Upon the fall of his nation he had escaped into Winter along with some of his compatriots. But he still dreamt of a triumphant return, some day. Despite his own better judgment, the notion that the treasure of Anetene might be real had seized his imagination. He couldn't help talking about what he might do with a king's ransom in money: build a fleet and free his homeland. In his own mind, Dentius was still an embattled airman, biding his time. He was not *really* a pirate, though he acknowledged that he must play the role.

Venera had lain there with an arm across her eyes, willing him to shut up and die while he tried to justify and magnify his own existence.

Now he was clinging to the attention his men were giving him. "Are you ready?" he bellowed. The torch men raised their fists over their heads. "All right then. Light 'em up!"

Venera had to speak now or it would be too late. But it would do no good. As the first screams rose from the nets, Venera could only look away. Beside her, Aubri Mahallan was sobbing.

"All engines ahead slow," directed Dentius. "We want just a whiff of a breeze to stroke that fire back over the rest of them." The crew of the pirate were whistling and hooting now, a din to match that of the screaming coming from the *Rook*. Dentius looked down

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over it all like some pale bird on his perch, and laughed.

Venera became aware of the cracking sound only after something flickered in her peripheral vision. She turned to look but it was gone. Then, turning back, she blinked at the sight of twenty bikes swooping out of the darkness. Flashes from rifle fire lit them and suddenly Dentius's pirates were tumbling from the nets. Red dots of blood gleamed in the firelight.

"Get them!" Dentius began hastily clambering down the long pole, his lieutenants behind him. That left Venera and Aubri Mahallan pinned like targets between the ships.

The deep thrum of engines signaled the appearance of five cylindrical shadows. The *Severance*, the *Tormentor*, the *Unseen Hand*, the *Clarity* and the *Arrest* fell into a star formation around the Rook and its captor. Droning bikes and gunfire filled the air.

The fires on the nets were going out. At the same time, the ropes connecting them tautened and the helpless men were drawn in until they were pressed against the hull of the *Rook*.

Now the pole holding Venera and Mahallan wobbled and began to move. They were being drawn into the *Rook*, she thought in relief. It was better armored than Dentius's own ship. Moments later she found herself on the bridge with Mahallan, Dentius and his lieutenants. One of them slammed the metal hatch and the horrible sounds coming from outside dampened somewhat.

"Wait for it," said Dentius with a nervous chuckle. He pretended to count off seconds on his fingers. Before he reached ten, the sound of gunfire ceased.

He blew out a sigh of relief. "We've lashed their men to our hull," he said with satisfaction. "The bastards know they can't fire on this ship or they'll hit their own crew. We've got 'em by the balls." He turned to the pilot. "Let's get the hell out of here."

"If you try to leave they're likely to fire anyway," Venera pointed out. "They'll target the engines."

Dentius shrugged angrily. "Who cares?" He turned to the boy who'd taken over the semaphore chair. "Send 'em a message. Tell 'em if they fire we'll start shooting the prisoners. The ones we lit up have gone out, right? Maybe they'll take that as a good sign." He rubbed his chin. "All we have to do is make the rendezvous and we're home free."

Venera felt a languorous wave of spiteful pleasure wash over her. "No, Dentius, you're trapped," she said with a smile. "Just one rocket in the wrong place and this ship is going to explode."

He had looked away from her and was about to say something to his men. Now Dentius turned, a quizzical look on his face. "What did you say?"

"You really think I shot the bridge staff because they knew our destination?" She laughed. "They were going to scuttle the ship, Dentius. I stopped them. But after I did that, I armed all the charges myself—and broke off the key in the control box's lock." She pointed.

Everybody turned to look at the inconspicuous metal panel on the bridge's inside wall. "Once the charges are armed, any kind of disturbance could set them off," she said. "They're *supposed* to be on a hair trigger."

A new salvo of gunfire sounded outside. "That would be your men, shooting at the bikes," said Venera. "You know there's going to be return fire."

One of the pirates was crouched over the control box. "It does appear to be a scuttling panel, Captain," he said. "And there's a key broken off in the lock."

Dentius swore softly.

"Close your mouth, you look like a fool," said Venera.

"Belay that message!" Dentius dove for the semaphore chair. "Tell them we request a ceasefire!"

"But—but . . ." Dentius's lieutenants looked at one another, at him, at Venera.

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"Those five ships have no idea how fragile the *Rook* is right now," Venera pointed out. "And they've just watched their own men be set on fire. Do you really think they're going to be polite?" She shook her head. "It's time to come to terms, gentlemen. You can always threaten to blow us all to smithereens, so your situation's not hopeless. In fact, I'm betting you can escape with your skins and maybe even your own ship. But you'd better start talking fast."

Dentius's eyes were bulging and his face was bright red. He drew his sword and launched himself towards her.

She ducked behind the navigator. "You'd better negotiate with my *husband*, the *admiral*," she said quickly. "He's, ah, waiting outside. And Dentius, he'll be more inclined to accept your proposal if he knows I'm alive."

Dentius snarled. Then he turned to the semaphore man. "Send this: request immediate ceasefire. Admiral to negotiate disengagement. And somebody tell our men to stop firing!"

He glared down the length of his sword at Venera. "Be as smug as you want right now, lady. But I'm putting a price on your head that'll have every thug and cutthroat in Slipstream after you. I'll see you dead in a year, one way or another."

She shrugged out of the navigator's grip. "It'll be just like life back home, then," she said insouciantly. "But I wouldn't count on you living to put out that contract. Not once your own men are done with you."

There was silence after that, and then the outside hatch was opened and one of the lieutenants went out to fetch Admiral Chaison Fanning.

Slew, the head carpenter, nodded in greeting as Hayden eased the bike into the hangar. The man was standing with the hatch gang, who all waved. One of them even grinned at Hayden.

Come to think of it, there hadn't been the usual delay in getting the hatch opened when he returned from his search run.

What was all that about?

Hayden was bone weary, having logged ten hours in the air at his own insistence. All the *Rook's* bikes were out looking for the pirates; so far there had been no sign of them. Dentius and his mates had made a clean getaway, having negotiated a small head start as part of their terms of disengagement. None of the other ships had been seen either; Travis's theory was that they had a hideout somewhere among the icebergs.

Venera's racing bike was riddled with bullet holes and made an odd whistling noise now when it ran. It hadn't lost any performance, though. The thing was developing enough character that Hayden was beginning to think he should give it a name.

"Here, let me." One of the hatch gang whose name he didn't know reached out to help him hook the bike to its winch-arm. Hayden blinked at him in surprise.

"Thanks." He didn't know what else to say, so he ducked his head at the gang and left the hangar. Sickbay was at the back of the ship; he went that way.

A small mob of airmen, silhouettes in the lantern light, crowded around the angular box that was the sickbay. Somebody must have died, Hayden thought—and in a sudden rush of anxiety he elbowed his way through the crowd.

But no, he heard Martor's voice well before he got to the door. The boy was awake and talking. Not just talking: his voice wove up and down in pitch and volume, like a master storyteller's.

". . . So we's got this bag of *mines*, now, see. And Hayden sez, 'let's take 'em and blow those icebergs!' So there we are weaving our way in and out of the rest of the mines, voom voom, and we're in the clouds. And sure as itches, there's this great awful wall of *ice* comes at us out of the mist. Got this little tiny neck holding it to the wall of the world and Hayden sez, 'let her rip!' so I do.

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Boom!—ow! Oh, that smarts."

"In my report," came the surgeon's dry voice, "I shall state that Master Martor died of an excess of *hand gestures*."

"Yeah," somebody shouted over the laughter, "tone down the jumping about, boy. I want to hear how this ends."

Hayden paused at the doorway, uncertain of whether to go in. He didn't like that Martor had been talking about him, although that might explain why the hatch gang had been so polite just now.

Suddenly worried about what the boy had been saying, he tapped the man in the doorway on the shoulder. "Well, here he is, the man his-self," said the airman as he shifted to let Hayden past. He glided into the sick bay and grabbed the back of a cot to stop himself.

Wounded men tiled the floor, walls and ceiling of the place. Nearly all of them were awake and apparently listening to Martor, who had pride of place, propped like some parody of a doorman by the entrance to the surgery.

"Hayden, I was just telling the guys how we blew the icebergs and saved the fleet!" Martor's ferret-like face was twisted into a quite uncharacteristic smile. "The pirates flew right into 'em, blam blam blam!" He laughed and immediately winced. "And then," he said to the general crowd, "he sez, 'Now let's go back and save the *Rook!*' Just the two of us, can you imagine? But he—"

"I did no such thing," Hayden said sternly. "I wanted to get the hell out of there."

"But *Hay*den," stage-whispered Martor. His eyes darted at the listening men. "Tell 'em how we attacked the pirates, huh?"

Hayden crossed his arms and gave his best adult's frown at Martor. "I don't remember us attacking the pirates, because after we saw that the *Rook* had been taken, this little snake rapped me over the head with a rocket when I tried to fly him away to safety."

He couldn't have said what he expected, but Hayden was vastly surprised as the assembled men broke into peals of laughter.

Someone clapped him on the shoulder. "Ah, Martor, I wondered just how far your lying instinct would take you this time," said one of the officers. "Too bad you had a witness this time."

"But it's true about the icebergs," Hayden said quietly. "At least—we did blow them. I can't vouch for whatever else he might have worked into the tale."

"Like the emergency stop at the whore-house?" someone asked.

"Or the swordfight with the hundred pirates on bikes?"

"Or the—"

"I never said that stuff!" Martor tried to get out of his bed, grimaced, and let the elastic sheet flatten him back against the wall.

"This has gone too far!" shouted the surgeon. "The lad really is going to bust a kidney if you all keep this up. Out! Out! That goes for you too," he said, waggling a finger at Hayden.

Hayden couldn't suppress his grin. "Since I know you're not dead, I'll be on my way," he said to Martor. "But no more lies about me, you hear?"

"Yes sir," said the boy sullenly.

Hayden headed for Aubri Mahallan's little workshop. All around him the ship was abuzz with talk. He knew this, he'd seen it before after the few one-sided fights he'd been in when he was a pirate himself. The trauma of the battle and captivity had to be exorcized somehow; there were some fights, the settling of scores, but mostly, the airmen were exchanging their stories. In the process they were building a whole mythology around the battle.

It seemed that Hayden had unwittingly placed himself at the heart of the myth.

He nodded at another airman who had casually saluted him on the way past, and knocked on the door to Mahallan's wooden cube. There was no an-

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swer.

Was she hiding? Hayden hadn't talked to her since the battle. He had only seen her, looking starkly grim and pale, her hair a rat's-nest and her fingernails chewed to the quick. She had avoided his eyes. He was worried about what might have been done to her by the pirates, but so far that part of the incident had not been worked into any shipboard stories.

"She ain't there," said the airman who had saluted him. Hayden turned, eyebrow raised.

"Up at the bow, talking to the Lady," said the airman. Venera Fanning was another hero of the day; her quick thinking in palming Captain Sembry's key when the pirates burst into the bridge and killed everyone had ultimately saved the *Rook*. A craftsman was apparently on the bridge right now, delicately teasing the broken key out of the lock to the scuttling panel.

"Lucky thing the admiral gave a good account of himself in the fight," someone had said earlier; "else we'd all be saluting his wife instead of him."

"Well go on," said the airman now. "They'll be wanting you anyway. We're arriving at that weird tourist city, and Mrs. Fanning wants to visit it."

Admiral Chaison Fanning felt very small in this place. He didn't like the sensation at all.

The tourist 'station' was really a city that dwarfed any place he'd seen—or even heard of—in Virga. It spread for miles across the ceiling of Virga, a glittering chandelier of towers like fiery icicles, globular dwellings hanging from long tethers, and vast spinning cylinders, each one three or four times the size of the towns of Rush. It was to the axis of one of these cylinders that the *Rook* had gone, under Aubri Mahallan's instruction. Now Chaison walked the streets of a city that seemed more delirium dream than reality.

Some cunning of artifice had hidden the shape of the town; it didn't appear to be rolled up and spun, as it really was. Above Chaison was an endless sky of blue, and the city's confectionary towers were laid out on a seemingly flat surface. The streets converged in perspective until they blurred into the hectic detail of buildings, people and floating unrecognizable glowing things. Signs, some of those—but more were mobile, and some, he'd noticed, could speak.

The people were just as bizarre. They were dressed—when dressed at all—in sloppy imitations of Virga's fashions. They came in all sizes and skin tones, including unlikely shades like blue and vermillion. They crowded the streets in their millions, gabbling and waving their hands at faint squares of flickering light that buzzed around their heads like bees. Images flashed across these squares like heat lightning and everywhere, there was a chaos of noise.

He and Venera had to hurry to keep up with Aubri Mahallan, who stalked through the crowd with her head down and her shoulders hunched. The strange gate-keeper who had met the *Rook* at the docks had insisted that no more than two natives accompany her. "Take no pictures," he had said in a sibilant accent while smaller versions of himself—identical right down to the clothes—perched on his shoulder or ran laughing down the hall behind him. "Take no items, leave anything you want."

"We've come to recover a work of art loaned to one of your museums two hundred years ago," Venera had said. "It's ours, not yours."

He'd raised an eyebrow while one of his smaller selves stuck out its tongue. "Take it up with the museum," he'd said. "Not my area of concern."

Chaison quickened his pace until he was walking abreast of Mahallan. She still looked drawn and grim. He cast about for something to say, finally deciding to directly confront her most likely complaint. "I had to let the pirates go," he said. "We might have reneged on our

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bargain and blown them up as they left, but then they might have gotten a rocket or two into the *Rook* at the same time."

After a few moments she looked over at him, an expression of distaste on her face.

"Is that why?" she asked. "Because you were afraid they'd blow up the *Rook?*"

"It's a sufficient reason," he said. "But no, that's not all. We did make an agreement. And while my entire crew and all of my officers howled for revenge, I am bound as a gentleman to keep my word. Even more importantly than that, I just had no desire to cause any more deaths this week."

Mahallan mulled this over, but the dark expression on her face had not lifted. "Are you happy to be back among your own people?" he asked her.

"No."

The silence drew out. Clearly companionable solicitations were not going to work. "Well, you've seen the ships of the fleet in a real engagement," he said after a while. "If your opinion about the usefulness of your devices has changed at all, I hope you'll tell me."

Mahallan glared at him. "Is that all it was to you? An 'engagement'? Something to be picked apart afterwards, analyzed and stuffed for future consideration?"

Her anger didn't impress Chaison. "As a matter of fact, it's a requirement of my position that I view it that way. Why? Because understanding everything that happened is the only way that I can hope to save more lives next time we're forced to fight. And saving lives is my job, Lady Mahallan. I bend every effort to achieve military objectives with the least possible loss of life. That is why we are in this city, walking these streets, isn't it?"

She stopped and pointed down a shadowed and empty side-street. "There. The entrance to the Museum of Virgan Culture's storage depot." Then she took off down the narrow way at a renewed pace.

"I—I'm sorry you were abused, Lady Mahallan," he said before she could get out of earshot. "The incident has been hard on us all."

"Don't bother," said Venera cheerfully as she took him by the arm and sauntered after Mahallan. "She's bitter. People enjoy being bitter. It gives them license to act childishly."

"Aren't you the philosopher," he said with a laugh. "Are you unscathed by, ah, recent events?"

"I wouldn't say that," she said, glancing down.

"Dentius didn't touch you, did he? I know you told me not when we were negotiating with him, but you knew I'd have run him through if I thought he had."

She looked him in the eye. "He didn't lay a finger on me."

Chaison breathed a heavy sigh of relief. "I didn't want you to come," he said. "Things like this happen. This is no Society outing, Venera."

"I coped."

At the end of the street was a reassuringly real-looking door. Mahallan was waiting impatiently for them in the shadows.

"Admiral and Lady Fanning, this is Maximilian Thrace, the curator of the Museum," she said in a voice that had suddenly gone sweet.

Beside her hovered a ghost. That, at least, was Chaison's impression of the apparition; he could see right through it. Thrace bore many resemblances to a human being, but there was no color to him, only stark white and shades of grey. His head was disproportionately large and he had huge eyes. "Max is a Chinese Room persona from a very old and respected game-church," Mahallan whispered. Chaison nodded politely.

He bowed to the vision. As he was straightening, Venera said, "We've come to recover an artifact you've had on display here for a long time. It's called the .

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. . ." She turned to Chaison, one eyebrow eloquently raised.

"*The Winding Tree of Fate*," he said with a smile. "It's important to a small but influential group of artists in Slipstream, our home. Our documents show that it was placed on loan here, two centuries ago."

Thrace's frown was magnificently overdone, a great downturning of the mouth that distorted his whole jaw. "You wish us to return all representations, versions, models, simulations and copies of the piece? That could be difficult, it will require viral legislation that could take months—" Mahallan was shaking her head.

"We just want the original."

Thrace's eyes narrowed ever so slightly. "The what?"

"The artwork itself," said Venera. "The item that your, ah, copies are based on."

"That's why we asked to meet you here," added Mahallan, "at the storage depot."

"You just want the original? Nothing more?" Thrace looked tremendously amused. "You could have just sent us a . . . what do you call them? A letter. We'd have mailed it back to you!" He turned and gestured, and the door in the wall opened by itself. Chaison jumped at this, but nobody seemed to notice.

As Maximilian Thrace drifted into the dark hallway revealed by the open door, he said, "Space is expensive here. It would have cost us less to send it back to you than to continue to store it. We could even have hired escorts if you wanted."

Chaison stopped walking. Thrace's ghost continued on; Venera had given him her arm, so apparently he had some solidity although his tiny feet waved impotently some inches above the floor. Chaison shook his head and looked away. There was nothing else in this long narrow corridor to look at, except Aubri Mahallan, who had paused to look back at him.

"Did you know this?" he asked her. She looked apologetic.

"I doubt he's telling the truth about the escort," she said, falling back to walk beside him. "I knew they would ship it to us if we asked. But we'd have had to send a courier ship here to do that, and then wait . . . time was tight. It didn't seem practical."

"In the future," he said tightly, "please allow me to make such judgements."

"Sorry."

Civilians! He hated them as a species. Chaison trudged along, thinking about the lives lost in getting here. They were all ultimately his responsibility. But it was an awful thing to make choices in ignorance of potential alternatives.

Mahallan seemed to just be realizing her mistake. "Listen, if I had known—"

"What is he?" Chaison gestured at the wraith who was walking and laughing with his wife. "Is he a real person?"

"Ah." Mahallan shrugged awkwardly. "Define 'real'. Max is a Chinese Room persona, which makes him as real as you or me." She saw his uncomprehending stare, and said, "There are many game-churches where the members of the congregation each take on the role of one component of a theoretical person's nervous system—I might be the Vagus nerve, or some tiny neuron buried in the amygdala. My responsibility during my shift is to tap out my assigned rhythm on a networked finger-drum, depending on what rhythms and sounds are transmitted to me by my neural neighbors, who could be on the other side of the planet for all I—" She saw that his expression hadn't changed. "Anyway, all of the actions of all the congregation make a one-to-one model of a complete nervous system . . . a human brain, usually, though there are dog and cat churches, and even attempts at constructing trans-human godly beings. The signals all converge and are integrated in an artificial body. Max's body looks odd to you because his church is a manga church, not a human one, but there's people walk-

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ing around on the street you'd never know were church-made."

Chaison shook his head. "So this Thrace is . . . a fake person?"

Aubri looked horrified. "Listen, admiral, you must never say such a thing! He's real. Of course he's real. And you have to understand, the game-churches are an incredibly important part of our culture. They're an attempt to answer the ultimate questions: what is a person? Where does the soul lie? What is our responsibility to other people? You're not just tapping on a drum, you're helping to give rise to the moment-by-moment consciousness of a real person . . . To let down that responsibility could literally be murder."

He looked at her sidelong. "You seem awfully passionate about this for a voluntary exile. Did you belong to one of these churches before you came here?"

"Oh!" She looked like someone who had just realized that she'd said too much. "No, it's just that—"

"They told me you were here!" said a voice behind them.

Chaison turned quickly, hand going to his waist where his sword should be—but wasn't. An ordinary-looking man of medium height and age had come up behind them as they talked. His accent had not been like Aubri's, Chaison realized. He had sounded like he was from Virga.

"Aubri Mahallan," he said now, arching one eyebrow. "What could you possibly be doing back at the station?" She shank back.

Stepping between them, Chaison said, "And you are. . . ?"

"Aston Shen," he said, holding out his hand for Chaison to shake. "Virgan home guard."

"Home guard?"

"You've never heard of us? Good! Then we're doing our job." Shen smiled at Chaison's expression. "There are always some people of every generation who become curious about the outside world, you know. A few hundred find their way here every year. Some emigrate and never return. But some of us . . . find a higher calling. The home guard exists to protect Virga from outside influences. We try to ensure that no bad elements enter our world." Deliberately, he looked past Chaison at Mahallan. "And when they do . . ." He eased past Chaison. "So, Aubri, what have you been up to?" he asked. She shrugged.

"Just living my life, Aston. As best I can, now that I'm here."

"So? And the purpose of your business in the station?"

Chaison interposed himself again. "She is here on my business. We needed a native guide. I'd kindly ask you not to interfere."

Shen held his hands up solicitously. "Wouldn't think of it, old man. As long as you know to be careful with this one. She's not to be trusted."

"Oh really? I—" They were interrupted again as Venera returned carrying something. She held it up triumphantly and beamed at Chaison.

"We got it!" The thing appeared to be an intricate branch with extremely tiny leaves, if those finest bifurcations were leaves at all. Jewels glinted here and there inside its tangles.

"I'll expect delivery of the paintings tonight, then?" Thrace was saying to her. Venera nodded vigorously. "Come dear, we should get back." She noticed Shen. "Well, hello."

"Ma'am." Shen turned back to Mahallan. "We'll do a full-pass sweep of you and your companions before you're allowed to leave. I thought it polite to let you know." Seeing Chaison's expression, he smiled and bowed. "You won't even know it's happening. Just remember," he said to Mahallan, "we're watching you." He walked away.

Venera watched him go. "What an unpleasant person," she said. She had that appraising look that Chaison had learned meant that her instincts for paranoid intrigue had been triggered. "Let's get out of this place," she said to him as she smiled again at Thrace.

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As they walked back to the ship Chaison tried to sort out everything he'd just seen and experienced. But he was tired, and Venera's excitement just too infectious. By the time they reached the *Rook*, he had forgotten Mahallan's explanation of her people's churches, and couldn't bring himself to speculate about the Virga home guard or Shen's cryptic warnings.

None of it mattered anyway. They had the map they had come to find.

11

The scene was an eery repeat of Dentius's call to execution, only now it was Chaison Fanning who perched atop the T-bar and addressed all six of the ships. The vessels were temporarily lashed together into a loose star formation. Their crews sat or stood on their hulls, dark silhouettes casting long shadows from the spotlights that lit Fanning.

The admiral gestured with his bullhorn. "We are a long way from home. We have gone through the trials and tribulations of a minor war, and yet I have not told you why.

"Now, I will tell you why."

A murmur went through the assembly. Hayden Griffin, who sat astride his bike comfortably invisible in the dark air, strained to hear what the crewmen were saying. Resentment battled respect among them, he knew. Fanning was known to have fought gallantly against the pirates, but then he had also let Dentius and his men escape. There were airmen listening now who would always bear the scars of Dentius's torturer.

This had better be good, Hayden thought, knowing that the same thought must also be going through everybody else's minds as well.

"Before I explain our mission in full," said the admiral, "I'm going to tell you a story." He held up a hand, face slightly turned away. "This is no cocktail party anecdote, designed to soften up an audience. I know you're exhausted. This story is vital to your understanding our purpose. It's a story that concerns pirates, in fact.

"Two hundred years ago, Winter was not the quiet place that it is today." If he expected a laugh at this point, Fanning didn't get it. "We've tangled with a modern pirate armada. But Dentius's force is nothing compared to the old ones. Once, pirate navies fought their way into the heart of civilized nations. They plundered suns. Their blades reached all the way to the precincts of Candesce itself. And the greatest of the pirates of that age was Emile Anetene.

"Anetene was a fop. He was an educated man, with refined tastes. Such men become the most savage of killers, and Anetene was the finest at it. He plundered the principalities of Candesce; he terrorized Slipstream's borders; and eventually, he inspired the wrath of the whole world, so that a vast navy was assembled, comprising ships from most of the worlds of Virga. And they hunted him down.

"Now, you might think that it was Anetene's depredations that caused the nations to finally react so. Most people think so; we in the government have always encouraged the impression that it was out of compassion for our set-upon citizens that we hunted Anetene down. But that's not true.

"Anetene stole one particular thing—a small, seemingly insignificant object. When the heads of Virga's states found out—particularly the principalities of Candesce—they acted instantly. No amount of rapine and slaughter could have galvanized them to do so. One theft did."

Fanning paused. The men were silent now, confused but also curious. The admiral looked away into the darkness, appearing to gather his thoughts. His expression was serious.

"This expedition was undertaken after certain facts came to the admiralty's attention," he said. "We knew all about the threat from Mavery, and you and I know that this threat was never great.

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We were always able to defend ourselves against the likes of them. But let me ask you something. Their rocket attack on Rush—the one that so surprised us all, and that precipitated the Pilot's order to send out the fleet . . . many of you were there. You are military men. Did that attack *make any sense to you?*"

Fanning nodded, as though to himself, and said, "That attack was a deliberate provocation. It was designed to draw us out. But why would Mavery do that?—When we were sure to make mincemeat of their navy in the ensuing battle?"

Now the murmurs started again. "Somebody's with 'em!" someone shouted.

"Exactly. They've got allies. To be precise, they have *one* ally that intends to join them to crush Sliptream. That ally is Falcon Formation."

Shouts of anger and dismay met this news. Hayden nodded to himself. He remembered now the photographs he had seen in Venera Fanning's hand. A fleet being commissioned.

"Slipstream's very existence is threatened!" shouted Fanning. Hayden leaned forward, his mouth dry. For years he had dreamed of hearing such news—but that it should be the Formation . . .

"Falcon Formation is our most powerful neighbor," said the admiral. "We've had little to do with them because our long journey of exile has taken us on a tangent course. It's a good thing we never attracted their attention before, even when we were conquering their neighbor Aerie. The Formation is a dark bureaucracy, a super-Confucianist state ruled by an hereditary caste of bloodless clerks. They are fanatics who are determined to one day rule over all of Virga. And they have decided that Slipstream is a prize worthy of their ambitions.

"We might be able to hold off an invasion by the existing Formation fleet. I beseeched the Pilot not to fall for Mavery's diversion. We would need all our ships to thwart an attack by the Formation. But a month ago we learned that Falcon Formation is building a new weapon that they are going to use to crush us."

As Fanning told the men about the Formation's secret shipyard and the dreadnaught being built there, Hayden found himself wracked with conflicting emotions. The prospect of Slipstream being conquered was exhilarating. On the other hand, if Falcon Formation moved in on the conquered territories of Aerie, they would never give them up. Aerie's people would be assimilated into the cold dictatorship of that notorious bureaucracy, and Aerie itself would be erased from the history of Virga.

". . . No allies will come to *our* aid," Fanning was saying. "Therefore, we need a miracle. You, men, are here in Winter to provide that miracle.

"The stories they'll tell about you! Each and every one of you will be entered into the roster of Slipstream heroes when our journey is done. For we are on our way to destroy the navy of Falcon Formation!"

A stunned silence greeted these words. Fanning looked around slyly. "Is he mad? That's what you're wondering. How are six ships—and the ghost of a seventh whom we will never forget—how will such a tiny force prevail against the hundred cruisers and carriers of Falcon?

"I will tell you how.

"There exists a weapon that will give us an unassailable tactical advantage over Falcon's ships. It will allow us to maneuver in darkness and fog as though we were in clear and empty air. It will let us fly and bank and turn in utter darkness at two hundred miles an hour, all the while keeping Falcon Formation's ships centered in our cross-hairs. We have come to Winter to acquire that weapon!"

A babble of protests, shouts of delight and heated arguments wafted through the dark. Fanning gestured for silence. "Please! I've heard all the objections before. If such a weapon existed, why isn't

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it being used? Why doesn't Falcon Formation have it?

"The reason," he said more quietly, "has to do with Candesce. The sun of suns emits radiation that interferes with certain types of machine. *Radar* is one of the devices that won't work within Virga—though it works everywhere else in the universe. Anybody can build a radar set, it's just an electrical device. You've all seen electricity, we use it for lighting and electolysis. But getting anything but noise out of a radar set, that's another matter, here in Virga.

"But there is a way to make electrical devices work cleanly. The secret was lost two hundred years ago—stolen from the flagship of one of the Principalities of Candesce by one of the most legendary figures in history."

Fanning laughed. "Yes. We come back to Emile Anetene. His story is almost mythological—indeed, it wasn't until we visited the tourist city and I saw the map with my own eyes, that I allowed myself to really believe that the legend of the treasure of Anetene is true."

Hayden had to smile at the muted reaction to this. The men had heard too much that was unbelievable already. One more preposterous notion piled on top of the rest made little difference.

That is, it didn't at first. Fanning explained how Emile Anetene had stolen something—a key, though to what he didn't say—and hidden it with the rest of his hoard. He then died in a hail of rockets, cornered by the allied navies of Candesce. Almost from the first there were rumors about the hoard. No one had plundered it, the legend went, because Anetene had left the only map with one of his women—and she had hidden it somewhere no one would ever find it.

"We found the map," said Fanning. "We have it. Within the week, you will be plundering Anetene's hoard." He laughed again briefly. "At this point, you needn't believe my story. Just lend me seven days of service, and we'll all know for sure if the legend is true. And if it is . . . then the treasure is yours."

"Now that's more like it!" yelled an airman with a broken arm. The others laughed.

"We will return with the treasure and working radar. We will demolish Falcon Formation's secret shipyard and anybody else who gets in our way. We will save Slipstream and you will return to your homes rich as Pilots.

"Anybody object to that?"

Hayden spun up the bike and drifted it to the *Rook's* open hangar doors. Fanning continued to field questions, though he wouldn't answer any more about how this radar thing was going to work. Many of the men considered his story a ridiculous fabrication, but they agreed that giving him a week to prove it was fair.

Having worked with Aubri Mahallan to build the radar units, Hayden already believed.

After securing his bike he sought her out. The two of them still hadn't spoken properly, and he intended to find out why. Her workshop's door was tightly closed, so he rapped on it smartly. He waited, and when she didn't answer, he rapped again.

"I can keep doing this," he said loudly.

There was a long pause, then the door flew back. Aubri was braced just inside. Her eyes were red. "What?" she snapped.

"Can I come in?"

Silently, and with obvious reluctance, she drew back to allow him to enter. Her workshop was a shambles. The pirates had evidently ransacked it, but surprisingly little was actually broken—or not so surprisingly, he remembered now. Pirates had so little of their own that they prized, rather than destroyed, whatever they could steal of others'.

"I just wanted to see whether you were all right," he said after a long and awkward silence. Aubri shrugged, and finally nodded.

"Why did you come back after the bat-

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tle?" she said in a subdued voice. "To make sure you were right?—About the *Rook* being taken?"

"I was hoping it wasn't."

"Or maybe you didn't come back at all," she continued. She wasn't watching him, but was nervously organizing the debris in the room. "Maybe you were on your way to the station when Martor figured out you'd abandoned us all. And that's why he knocked you out."

Anxious, but unwilling to back out now, Hayden shrugged. "Think what you will. I wasn't wrong, was I? The *Rook* lost the battle. The ship was boarded. If it hadn't been for Venera's quick thinking . . ."

"This world is an awful place!" she burst out suddenly. "It's got a beautiful mask over it, but when you tear that away . . . I've never seen such ugliness as I saw here. Brutality . . . You people are animals."

"I couldn't agree more." She looked at him in surprise. "If the world needed saving it wouldn't be worth doing it," said Hayden. "Everything worthwhile ends up getting stolen by someone evil. You hate the pirates who tried to take the *Rook* and its people? Well, some pirates are so powerful they get to call themselves by other names. Names like 'Pilot of Slipstream.' What's Slipstream if not the biggest pirate armada in the world? So big that they don't capture and plunder ships, but whole nations."

"What are you talking about?"

He sighed. "Do you know anything about the people you're working for?"

Aubri narrowed her eyes, searching his face. "This is some sort of justification for why you wanted to abandon your friends, isn't it? They're bad people, so you're justified in only being in it for yourself, is that it?"

Angry now, he said, "I tried to save you."

"How generous! Since you were abandoning us anyway you might as well have company."

"I didn't abandon anyone. After you refused to come with me . . . there was no reason for me to leave."

"And I believe that!"

"There's nothing for me out there. I haven't got a future. I just thought it might be worth saving the life of somebody who did have one."

"Then you picked the wrong person to save."

They were nose-to-nose, glaring at one another. It took a few seconds for her words to register with Hayden. "W-what did you say?"

"Just get out," she said. "I don't need your help anymore, *assistant*. You know our machines are ready." She put her hand in the center of his chest and pushed. Confused and angry, Hayden let himself sail out the door.

Slew the carpenter had watched his exit and now smiled. "They're all trouble, kid. Take my word for it, that's as good as you're gonna get from her."

"Shut up." But Slew just laughed at him, and Hayden, ears burning, retreated to the hangar again.

Finding itself in a stray beam of sunlight from distant Candesce, the capital bug shrugged awake. It unfolded its six legs and stretched them ineffectually into the cold air. There was nothing to grab onto for a hundred miles in any direction, but it didn't care much; it lived on stray flotsam and jetsam and could hibernate for months at a time. The heat of a sun could waken it, though, and as it felt the distant rays of Candesce it spread its diaphanous wings, and began to hum.

"Batten the hatches!" The *Rook's* new boatswain leaped from one side of the vessel to the other, following his own order. The lads in the hangar were hastily dogging the doors as well; but it did little good. The world-shattering drone of the capital bug wormed its way into every nook and cranny of the ship. The crewmen cursed and clapped their hands over their ears, but the buzz seemed to resonate all the more inside

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their skulls. One by one, across the ship, the wind-up lantern flames flickered in the choppy air and went out.

Hayden had been asleep on his bedroll in the ship's centrifuge. He was used to all its noises now, and even the thunder from test-firings and target practice couldn't wake him. But the sound of the capital bug had him instantly alert.

As he exited the now-shaking wheel he saw Travis's face floating in the solitary illumination of the last opened porthole. "Will you look at that!" said the officer—or at least, those were the words his mouth shaped. Hayden couldn't have heard him from six inches away.

Over the past few days Hayden had discovered that Travis liked or at least respected him. The feeling was mutual; the man didn't treat the presence of civilians on his ship as a threat to his authority. So Hayden didn't worry that he was tempting fate by putting his head next to Travis's and looking out the porthole.

Dots of cloud patterned the air around the capital bug, throwing small lozenges of shadow on the vast, distance-blue curve of its abdomen. That flank was all Hayden could really see at the moment; any details about the rest of the beast faded into darkness or blue to either side. Cruising up and down the vast wall of flesh were flocks of birds or fish, apparently immune to the drone that could kill any man who came too close. Closer to the *Rook*—only a few miles away—a number of large black spheres turned lazily in the sudden sunlight. These were surrounded by wreaths of yellowish mist and swarming dots.

The buzzing stopped, leaving a ringing silence that was, in its own way, just as painful as the noise.

Travis grinned. "That's a real capital bug, isn't it?" It sounded like he was on the other end of one of the ship's speaking tubes.

Hayden nodded, digging in his ears and then checking his fingertips for blood. "Good thing we weren't any closer," he shouted.

"What're those things?" Travis pointed at the town-sized spheres of black in the middle distance.

"Bug shit," said Hayden. "You don't want to go near it. Great for growing mushrooms, though."

"I can't believe anything that huge could be alive."

"They're mostly empty space. A big balloon, like the world itself I guess. The bugs even have their own forests and lakes and stuff inside them, or so they say."

Travis gave one last wistful look out the porthole, then turned away to attend to his duties. Hayden stayed where he was as up and down the *Rook* men threw open the rest of the portholes. The heat of Candesce was very faint, but it was sunlight on his face, and its very presence was vastly soothing.

"Don't get too comfortable," said a voice next to him. Hayden turned, blinking, to find Lyle Carrier hovering in the shadows.

"What?"

"I know you think you've made friends in high places," said Carrier, nodding at Travis's retreating feet. "But it's not really that they trust you, you know. They're happy to smile and chat with you because they know I'm watching you."

Hayden scowled at him. "What's that supposed to mean?"

"There's a lot of unanswered questions about you, boy," Carrier said, his mouth pursed in a by-now familiar moue of distaste. "And what answers you have given just don't add up. You see," he leaned in close, "*I* know you're up to something, and Venera knows I know. She has every confidence that I'll find out what it is. So she and your other betters are happy to indulge you for the moment. They know you're well taken care of."

Hayden stared back at him. It had taken him a long time to get Carrier's prop-

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er measure. He regretted not sizing the man up properly right at the beginning. Carrier was a killer; but Hayden wasn't afraid of him.

He cocked his head to one side. "You mean you've spent all this time skulking around watching me and formulating hypotheses on your own? And you never once thought to just *ask?*"

The slightest tremor passed over Carrier's left eyelid. It was enough discomposure to make Hayden smile.

"What are you up to, then?" said Carrier.

"None of your business," snapped Hayden. He turned back to the view.

"So that's the way you want to do it," murmured Carrier. "All right. Later, Griffin."

Hayden didn't hear him leave, but he refused to turn his head to check. For one thing, the sight outside was beautiful: the light from Candesce wasn't fading, if anything it was brightening, and no wonder for that was where the *Rook* and its sister ships were going.

But also, he didn't want Carrier to see his face right now. Carrier would have seen that Hayden knew he was now marked for death. You didn't insult a man like Lyle Carrier and get away with it.

So be it. Right now he needed an enemy he could hate unreservedly. His feelings about Admiral Fanning were too mixed to be satisfying. Carrier . . . that was another matter.

Hayden watched the *Rook's* sister ships skirting the precincts of the gargantuan capital bug. They set their prows in the direction of the sun of suns, and as the air continued to be clear and fortunately lighted, they all opened up their throttles and arrowed toward Candesce.

Two days later, and the way ahead was bathed in perpetual light. First one, then two, then four suns peeked out from behind the perpetual cloud banks of Winter. At first each was little more than an orange smear on the sky, its light diffused and filtered by hundreds of miles of air, water, and dust. Over the hours they sharpened, becoming in time tiny pinpricks of actinic light embedded in discs and arcs of silver and green which were the collective reflection of thousands upon thousands of individual houses, towns, forests, lakes and farms.

Gridde, the ancient chart-master, emerged from his velvet-lined chamber to hold up prisms to the light of these suns. He examined the miniature rainbows so created and consulted tables in a huge book that he had carried strapped to his back for so long that it had permanently dented the shoulder of his jacket. Then he pointed at each of the suns in turn and said, "The Nation of Tracoune, the Principality of Kester, the March Collective of the Hero Reeve and, er, what was the other damn one . . . that one's the Upstart Breakaway Republic of Canso."

The crewmen who had gathered to watch this procedure nodded and muttered sagely to one another. Few had heard of any of these nations, and none had heard of all of them. They were halfway around the world from Slipstream and its neighbors. More importantly, these were countries that steered their way through the intermediate airs of Virga, hundreds of miles above the principalities of Candesce but hundreds more below the layers flown by Aerie and other familiar places. Between were layers of Winter—dark, cold and choppy air that had proven over the centuries to be unlucky for the founding of nations.

"Gridde told me it's because there's cyclones, jet streams," Martor said later. "Things drift apart too easy. I guess if they didn't there'd been no Winter, just suns and countries packed from one end of the world to the other." He smiled wistfully. "Imagine that."

"Hmmpf." For lack of anything better to do, Hayden was polishing the racing bike for the tenth time. Now he looked at Martor with a sour expression.

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"There's too much junk floating around in civilized spaces. You can't take a bike above sixty miles an hour without getting somebody's discarded chamber-pot in the forehead—or worse, the loose contents of one. Plus which there's police every five miles waiting to ticket anybody who opens up their throttle. Far be it that you should rattle the windows of some rich man's house."

"I hadn't thought about it that way," said Martor.

"That's 'cause you haven't got enough bike time in yet. When you own your own some day you'll curse the density of civilized spaces."

Over the next few days Hayden's dim assessment of civilization was confirmed: the expeditionary force made little headway through increasingly populated air. Habitation began on the lowest level with basement spiders who wove long scarves of web that attracted flecks of soil and trash, gradually growing into rafts the size of dinner tables on which myriad other creatures thrived. The webs tangled in the *Rook's* vanes and had to be swept off with brooms. Birds, fish and insects, most thumbnail-sized but some big as boats wove and ducked around the mats. As the light of the suns brightened the mats were seen to be festooned with grass and wildflowers. In the distance the watchmen began to spot trees and farms. And everywhere, now, there was ship traffic.

Most of the local suns followed the diurnal rhythm of Candesce, otherwise there would be no darkness here at all. Some renegades did use their own time scales, for historical or political reasons. The result was that the nights here were more glorious than any Hayden had known. The air and clouds deepened to azure tinged with shades of turquoise, mauve and peach, and in this twilight a thousand town and house beacons glimmered. Hayden overheard Aubri say something about 'the stars' as she gazed at the view from the *Rook's* hangar. He didn't approach her to find out what she meant.

Nor were there any fights or loud arguments among the men. A spell of grace had settled over the ships, all the more precious because they knew it wouldn't last. For a few days they were just airmen, entering strange and wonderful skies.

They didn't approach any of these suns; their destination lay further in. The six cruisers threaded their way between border beacons, staying in international air as they approached the shell of civilization enshrouding the sun of suns. The principalities of Candesce became visible as a vast haze that curved away to all sides—the misty outline of a bubble hundreds of miles in radius with Candesce at its center.

The man-tended suns of the outlying nations fell behind as Candesce's radiance grew. Here were dense forests like gargantuan heads of broccoli, each dozens of miles in extent. There were equally big lakes, some shaped by scaffolding into lens-shapes that focused the light of Candesce into town-sized zones of incandescence for industry or waste control. The air began to smell hot and rich with life.

This was the most ancient part of inhabited Virga. Candesce had been here since the founding of the world, and some of the nations now visible had existed almost as long. The crew traded stories of fabled places and legends, of town wheels made of solid gold and forests as big as nations. The air was speckled with ships in all directions, and now they even spotted flying humans, intrepid individuals using leg-powered wings mounted on their backs, like angels, to travel between towns and houses. Ship traffic became constrained by beacon lanes and the six Slipstream ships dutifully kept within their boundaries.

Finally Gridde emerged from his cell again and went to perch like some ragged black bird on a hangar door. He measured the angles between Candesce

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and the suns they had passed, and eventually nodded. "Gehellen," he announced, "lies two days' journey that way." He pointed towards a part of the crescent of haze surrounding Candesce that looked to Hayden like any other part. As he folded himself back into the ship Hayden overheard him mutter to Admiral Fanning, "It's there that you'll find Leaf's Choir."

Two days later, the *Rook* and its sister ships stopped at a border beacon. The beacon itself was a wrought-iron and glass ball forty feet in diameter. Since it was day, its fires were banked, but the air smelled of kerosene for miles around. The lane markers had funneled all ship traffic into a choke-point here; all travelers had to pass near the rocket racks of an ancient, moss-encrusted fortress built of stone in a crude cube-shape. Tethered to this were four baroque, heavily carven cruisers flying banners Hayden had never seen before.

As the Slipstream vessels arrived, a squadron of bikes exited the fortress and moved to surround them. The cruisers's engines coughed into life and they began to edge forward, blocking the way. And deep within the shadowed stones of the fortress itself, the noses of rockets slid into view.

"So," said Slew the carpenter, who was sitting with Hayden in the hangar, "welcome to Gehellen."

12

". . . Lady and Baron Castermond." Heads turned to acknowledge the new arrivals. Chaison Fanning bowed, but by now Venera couldn't be bothered. She looked beautiful today, so she could get away with bad behavior. She intended to.

This ballroom was a chamber to equal anything in Rush, constructed of stone and glass, with all the extra spin-up cost that implied; of course, grand reception halls were intended to intimidate. Anybody who thought their purpose more innocent was an idiot.

"You see? I told you all the best people would be here," said Ambassador Richard Reiss. Slipstream's representative in Gehellen was a portly man with a wine-stain birthmark on his cheek. He wore local apparel, with flounces at the wrists and ruffles at the throat. For once Venera Fanning was grateful for the austerity of Slipstream military uniform; her husband looked positively rakish next to the ambassador.

"It's just a shame that your exotic passenger wasn't able to attend," continued Reiss. "What was her name again?"

"Mahallan," said Fanning absently. He tilted his glass to greet someone he didn't know.

"She had . . . research to attend to," said Venera. "This isn't a holiday for us, ambassador."

"Of course, of course. Nonetheless I'm glad we were able to throw this little soiree at such short notice." Reiss gently cupped Venera's elbow and led her toward a drinks table. "This evening's festivities could be essential to greasing the wheels of progress. You know, your ships . . ."

He hardly had to remind her. The *Rook* and its sisters were sitting idle at the military shipyard on the other side of Gehellen's capital city of Vogelsburg. They had been there for three days now, ever since the Gehellen navy had escorted them in under watchful guns. Venera couldn't really blame them for being cautious; you didn't just let foreign warships traipse through your territory. Not without giving them every inspection and putting the question to their crews. Chaison should have thought of that before they got here.

Still . . . the delay did have its advantages. Venera's first sight of Vogelsburg had electrified her. She had dreamed of this place.

This was the weightless city she had visited in her sleep so many times—she was sure of it. Vogelsburg's buildings came in all shapes and sizes, but very few spun to provide local gravity. They

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had confectionary shapes, with many honeycombed sides, frescoes, statues and minarets that stuck out all over. They looked like the diatoms her oldest brother had once shown her in a microscope. Joined together by ropes and kept apart by their minarets, they jostled in slow motion in the perpetually golden light of distant Candesce, just like in the dream. Vogelsburg's people flitted like birds in their thousands between the shifting structures.

The people themselves made Venera uncomfortable. Only the rich and powerful had regular access to gravity in Gehellen. Even they were much taller than she was used to—spindly and bandy, for the most part, though some of the women achieved a state of ethereal grace whose effect on her husband she didn't fail to notice. The lower classes were instantly recognizable: the servants in this ballroom could barely lift their heads, much less the drinks and canapes they served. They loomed like giant spiders over their betters, appearing uncomfortable and worried.

Venera could understand this dichotomy as the result of a deliberate policy to keep the poor weak. History was rife with examples of aristocracy reserving physical health and power for themselves, after all. What disturbed her was the possibility that this state of unequalness might have come about through simple neglect. That would imply a shameful decadence on the part of the principalities of Candesce.

As Reiss grazed over the drinks table, Venera took her husband's arm and leaned in close. "This is a very strange assemblage," she said.

"You've never been here before," muttered Chaison. "So how do you know?"

"It's the mix of people, dear. My father threw a little banquet like this once, for some of the outlying provinces' tax collectors. He brought them all together in one place, sealed the doors, and had them shot from the gallery."

Chaison gazed off into space. "Sounds like your father."

"Anyway, I don't like it. Look around yourself. We're cut off from the ships. All the officers are here. There's guards on the entrances."

He looked askance at her. "But they left us our sabers."

"As if that will help. Oh, mark my words, Chaison, I'm sure there's not going to be some sort of massacre. These people value their architecture far too much to risk chipping it with bullets. But something's not right, I'm sure of it."

"Well," said Chaison. "You keep an eye on things, then. Worry all you like. Meanwhile, I'm going to enjoy the afternoon. These people have done nothing to threaten us."

"That's only because we have six fully-armed warships sitting in their port," she whispered. At that point Reiss returned, a tall glass in his hand.

"Look who I just spotted." He nodded in the direction of a stiff-looking older gentleman who stood alone under one of the vast rose windows that dominated the ballroom's end walls. Colored lozenges of light from the stained glass dappled this man's dress uniform, and just now half his face was lit green. "General Harmond is here. I'll have to tell your husband—"

"Oh, I'll tell him myself," said Venera as she headed straight for the military man. Reiss made a surprised 'oh' sound as Venera outpaced him. Stopping in front of the general, she bowed. He instantly snapped to attention.

"General Harmond isn't it?" she said, eyes wide. "I've heard so much about you."

"Oh?" He looked surprised and wiped his palms on his hips before extending a hand for her to shake. "You're with the Slipstream party. Sorry about locking down your ships like that, it's uh, protocol."

"Oh I'm sure it's necessary," she said, waving a hand to dismiss the whole affair. "Protocol isn't one of my strong

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points. But I do have my hobbies, general, and I was hoping to meet someone authoritative enough to be able to indulge one of them."

"Oh, indeed? And what hobby might you be talking about?" The poor man looked like he wanted to flirt, but had no idea how.

"Small arms," said Venera brightly. "I have a fascination with rifles, pistols—small bore weapons."

"Really?" He goggled at her.

"I'm also a bit of a history buff," she said. "Wars interest me, and I'm afraid I've not kept up with recent events in this part of the world. I was hoping that you might be able to enlighten me—and fill in some sad gaps in my knowledge of Candesce armaments."

The general preened. "I'd be delighted. Just as long as you don't ask me about any military secrets, you know."

"Oh, I wouldn't know it if I was," she said demurely. "I'll have to trust you to correct me if that happens."

"Hmmf. Well, then. Rifles, you say? Our armorers are unmatched in all of Candesce, if I do say so myself. Take the Matchley forty-five, for instance . . ."

Venera listened intently, while Chaison Fanning wove his way through a maze of courtiers and ingenues, now faintly worried.

The round window of the palace's reception hall flashed crescent rainbows for a moment as it rotated up and away. Hayden turned resolutely away from the government town; the Fannings were behind that intricate glass and for once, were not his problem. Now that the bike had been ejected from the wheel's small hangar it drifted under him as he took his bearings.

"The library's over there," said Aubri Mahallan, pointing.

"Yeah yeah."

She held up her hands, palms out. "Just trying to help," she said.

Aubri wore flame-red today, an outfit of silk with harem pants whose long slit sides showed off her legs. Fanning wouldn't allow her to wear anything like this on the *Rook*. Hayden was determined not to let her know he'd noticed.

She was his passenger reluctantly; the Gehellens refused to let any of the *Rook's* military bikes fly through Vogelsburg. In fact, they wouldn't let any of the crew off their ships. Once again, Hayden was benefitting from his ambiguous relationship to the expedition.

He had seen and learned a lot since he joined the *Rook*. It was time to send a report about his experiences back to the resistance. Once he dropped off Mahallan he planned to find a local post office and draft some sort of letter. The problem lay in deciding what to write.

The bike's fan was whirring, so he leaned back and pumped on the ignition to send a spark into the bike's alcohol burner. It lit with a *whoosh* and the bike reared forward.

"Slow down!" Mahallan snatched at her handlebars.

"It always kicks like that when it starts. Don't worry, I'm not going to drop you."

"I'm more worried that you'll run into something. This place is *dense*."

"No denser than where I grew up."

There was a momentary silence as they wove their way into the slower traffic of foot-powered wings and propellers that streamed into the disordered jumble of the city. Then Aubri said, "You grew up in Aerie, didn't you?"

"Yes. And Aerie has its cities too. Or, it did—before Admiral Chaison Fanning and his fleet dispersed them and killed or drove out everyone I ever knew."

"He wasn't admiral when Slipstream invaded Aerie," said Mahallan. "I *do* know my history. He was promoted after the conflict ended."

"You've been reading," he sneered.

She held his gaze defiantly, then said, "Talking to the crew. Because you were right to criticize me for not knowing enough about the people I'm working for."

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This simple statement knocked most of the wind out of Hayden's sails, but by now he wouldn't back down. "They only told you their side, though," he said, "things like that Fanning's considered a hero for finding a secret Aerie sun we were building and destroying it, killing all the workers in the process. Some hero!"

"Well in that case I do know better than you," she retorted hotly. "The admiral told me the whole story. Fanning himself was against the attack—it was the Pilot's idea. In fact the Pilot insisted on going on the expedition himself and even took pot-shots with a rifle from the flagship! He treated the whole thing like a sporting event. Fanning's bitter about that raid; he told me he hadn't thought the new sun was a threat. He despises the Pilot, you know, and not just because the Pilot refuses to believe that Mavery is conspiring with the Falconers. Fanning lost several ships in the Aerie sun raid. The whole incident was a fiasco as far as he's concerned."

Hayden nearly ran them into a forty-foot wide food net that was being towed across his path by a flock of tame, feathered barracuda. As he fumbled with the controls he stammered incoherent curses. "My mother," he heard himself saying. "He killed my mother. The Pilot ordered my father executed, never saw him again. Killed them."

"*What?*" Mahallan leaned around the curve of the bike, unbalancing it so that Hayden nearly crashed them again. "Who killed your mother?"

He shut down the bike, turned and glared at her. "Fanning. Fanning killed her. I was there, at the new sun, when he came out of the sky and killed everyone I knew."

She drew back. Angrily he spun up the engine again and opened up the throttle all the way, dodging them around startled people and cargo nets. "Don't tell me what happened because I know what happened," he said even though she wouldn't hear him over the rip of the wind. "I was there!"

The library, her destination, came up all too quickly. It would be petty of him to overshoot it, or circle it; reluctantly, Hayden cut the engine and deployed the bike's parachute. He wouldn't look at Aubri.

When he did glance up, it was to judge the final yards of their approach to the library. This was not so much a building as a concretion: perhaps it had originally been a box, or pyramid or sphere of wood with ordered rooms inside it. If that were true, there was no way to tell. Over the centuries, individual rooms had been screwed or nailed onto the original structure, jutting out like barnacles. Whole floors were canted onto it and makeshift galleries built to connect them to the whole. Shafts had been dug through existing levels while other municipal buildings that possessed their own logic of construction had been towed over and added to the assembly. The whole bizarre pile rotated by slow increments causing the light from Gehellen's sun to tangle in confusing ways in its interior. People drifted like flies in and out of this migraine-inducing architectural disaster, and smaller flecks drifted too in their thousands: loose books not yet snagged by the haggard and overwhelmed library staff who chased them down in ones and twos using nets on poles.

The place was so byzantine and startling that it shook Hayden out of his anger. He laughed. "And what," he said, "do you hope to find here?"

She gazed at him sadly as he grabbed a strand of the big rope cone that framed the library's entrance. "The admiral wants me to research the destination our map points to," she said quietly as she unwound herself from the embrace of the bike. "But all I was really after was distraction."

Reminding himself that she too had been through a lot, he tied up the bike and paid a spindly man twice his height to guard it. At least, he hoped that was

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what he'd negotiated; the local dialect was almost unintelligible.

When he finished he found her waiting for him. Surprised, he stammered something that was almost but not quite an apology. Aubri sighed.

He had intended to leave her here for a few hours while he sought out some way of contacting the resistance back home. He would report the important information that Slipstream was threatened by Falcon Formation. What, though, was the resistance going to do with that information? Hayden had run through various scenarios in his head as he lay on his bunk listening to the snores of Slew the carpenter. His thoughts had not been reassuring. The resistance was likely to take the information and try to cut a deal with Falcon; they wouldn't have any faith in this mad venture of the Fannings. Maybe, if Hayden were some sort of hero, he could steal whatever it was that Fanning was after, and bring a radar set or two home with him. Then what? Give them to Falcon? He couldn't see any deal with the Formation that wouldn't seal the fate of Aerie once and for all.

Aubri had seen Hayden's hesitation, and frowning she turned away. "Wait!" He hand-walked up the netting of the entrance funnel to join her.

They drifted into a long cylindrical space with branching entrances leading off to all sides. The entrances were marked by subject matter. Ropes with hand-hold loops criss-crossed the space and bright lanterns lit the walls, their wind-up fans gently whirring. Whatever the chaos of its facade, inside at least the library seemed remarkably well organized.

"I'm sorry," said Hayden again. "I'm just not . . . very patient when it comes to the subject of Slipstream."

She looked sidelong at him. "They're your enemies, aren't they?" He nodded.

"It's true that Admiral Fanning led the attack on your sun, Hayden," she continued. "Even if it was really the Pilot who was in charge. I can't imagine what it must be like to be trapped on the *Rook* with him."

"It's intolerable," he admitted. At that moment Hayden was near having some internal dam burst and he knew it; one more sympathetic word from her and he would blurt out his whole life story like some maudlin teenager. "But things haven't exactly been easy for you either," he said.

She half-smiled. "Are you referring to the pirates? It was . . . bad, I admit. But that whole incident's over with, isn't it?" Her smile held sadness. "You should be grateful for traumas that have a definite ending to them. Some don't, you know."

"Believe me," he said, "I know." Then he narrowed his eyes. "You did this to me before."

"What?"

"Danced around the subject of why you're unhappy."

"Ah."

He grabbed a rope, and her hand, and stopped them above a square shaft that had the words 'Municipal Engineering' carved around it. For a long moment he felt her warm fingers wrapped around his; their eyes met. Then she drew her hand away.

He had to say something; what came out was, "I've been honest with you." That wasn't quite true, he realized. "Okay, I admit that's only been in the last few minutes. I did come aboard the *Rook* with the intention of killing Admiral Fanning, and I never expected to survive doing it. That's what I meant when I said I had no future. But when I said that, you suggested you didn't have one either. What did you mean?"

Aubri's expressive face twisted in eloquent distress. "I can't explain. Not in a way that you'd understand."

He crossed his arms and let himself hang in the air before her. "Is it because I'm an 'ignorant savage'? I believe you used that phrase to describe Martor a few days back."

She bit her lip. "It's not that . . . it's

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partly that. I don't know how to explain it to you." She looked around, spotted something and said, "I think we need to go that way."

Hayden thought she was changing the subject again, but as they flew down the hexagonal wood-paneled corridor to the library's history department, Aubri said, "I didn't come to Virga willingly. Not entirely willingly; I wasn't lying when I told you I had studied science and admired your people for their knowledge."

They entered a vast circular room that would not have seemed out of place under gravity—if one ignored the usual criss-cross of ropes that various readers were using as perches. Light was provided by bright lanterns which lit the endless ranks of books lining the walls.

"It was my love of ancient arts like manufacturing that got me into trouble," continued Aubri. In this light she looked very beautiful to Hayden, a troubled doll drifting in lamplight. "Along with some others, I tried to overthrow Artificial Nature—locally, at least. We wanted to go back to noble pursuits like industry and construction! Work with our minds and hands again. I confess that . . . entities died. Not humans, you wouldn't understand them, they were surfers, standing waves in the stuff of A.N. Taking down A.N. killed them. As punishment, I was exiled here."

"I understand something about being an exile," said Hayden. Aubri smiled.

"Before I can return I have to fulfil a mission for Artificial Nature," she added with a sudden frown. "It hangs over my head like a sword. If I don't do it . . . I'll die."

"What? They'll send an assassin or something?"

She shook her head. "The assassin is already here, inside my body. It waits and watches. If I don't play my role to its end, it will strike me down."

This revelation was the last thing Hayden had expected from Aubri. He tried to imagine some alien machine coiled in her throat, watching him through the veil of her skin. The thought made his scalp prickle. "So what's this mission?" he asked after a long silence.

"I can't tell you," she said simply. "It might activate."

Confused and upset, he followed her to a cage mounted on one wall. There perched a bored-looking woman with arms like birds' legs, her prehensile foot crooked around a strap while she filed books in various slots in the cage. "Can I help you?" she asked, looking down her nose at Aubri.

"Hello, I'm not from around here. I'm looking for information about Leaf's Choir."

The woman's face brightened. "My, what an interesting accent! Well, welcome to Gehellen. And welcome to the library. Did you know we've been continuously open now for two hundred forty seven years?"

"That doesn't surprise me at all," said Hayden.

"What about Leaf's Choir?" Aubri asked.

The librarian yawned. "The novels start over there, and wrap half-way around. Children's stories over there. Opera and plays, there."

"What about aereography?"

"Maps? That would be that section there." She pointed to the opposite side of the room. "But you won't find much, comparatively speaking. Leaf's Choir is much more interesting as a story than as a place."

"Why's that?"

"It's just a burnt-out shell now. Nobody can go in very far because of lack of oxygen, and occasional flare-ups. And whatever was in the outer layers was stripped decades ago. Leaf's Choir is a sargasso."

Suddenly Hayden understood. The extra fittings on the *Rook* weren't just for Winter travel; they included air tanks and sealant for the portholes. The ship had a furnace but it also had a rock-salt battery for storing heat.

We're going in there, he thought, in

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sudden wonder.

"It must have quite a history to be the subject of all those novels," said Aubri as she gazed at the stacks. The librarian nodded.

"The original story's as fabulous as the novels," she said. "Once upon a time, two suns burned in the heart of Leaf's Choir. The suns were invisible from outside the nation because they were surrounded by a single, vast forest: millions of weightless trees connecting and reconnecting like the threads of a spiderweb through an intricate network of lakes and rock bits. The forest made a sphere over fifty miles across and within it were dozens of towns and hundreds of villages built out of the living branches of the trees." The librarian shaped the forms with her hands, long shadows cast by the lamps interpreting her gestures on the bookshelves behind her. "The impenetrable barrier of foliage provided protection as well as wealth to the citizens of Leaf's Choir, and they prospered.

"After centuries of peace, rumor began to circulate of the beauty of an heiress from Leaf's Choir, and that rumor attracted the attention of a warlord who determined to have her for himself. He laid siege to Leaf's Choir and was finally able to seize the giant air pumping stations that kept the forest from supersaturating itself with oxygen. He threatened to blow up the stations unless the young lady was turned over to him. The government refused but the heiress secretly fled the capital and made her way to the warlord's encampment, and there gave herself up.

"To punish the nation, the warlord ordered the pumping stations blown up. Then he left—and behind him, the millions of trees of the forest continued to bask and produce oxygen. Leaf's Choir had cultivated them for centuries, to the point where it needed the artificial circulatory system of the pumps to ensure that oxygen did not build up to dangerous levels within the nation. Without the pumps, the least spark might set off an impossible conflagration—and so it happened, weeks after the warlord left. The fire raged out from the heart of Leaf's Choir and consumed everything, town, tree and sun. All that was left when it was over was a sphere of charred wood and ash thirty miles across. That sphere is now tethered at the edge of Gehellen's territory; we've been mining it for its charcoal for centuries. It's very slow work because the heat of combustion is still trapped in airless pockets deep inside the sargasso. If oxygen reaches them, they break into flame again; so Leaf's Choir remains choked with stagnant, dead air. We have special ships that can go in, but navigation is a nightmare, it's all just black twisted wreckage that goes on forever. Leaf's Choir is ugly now—like a scar on the sky. Nobody goes there, unless it's for mining."

"That's very sad," said Aubri.

Yet somewhere deep inside it, Hayden mused, was the hidden treasure of the pirate king.

They spent several hours poring over maps of the place. The librarian was very helpful—Hayden and Aubri were a blessed break in her routine, it seemed. They both began to relax in each other's presence again. Hayden couldn't help but be distracted by occasional flashes of thigh or calf when Aubri reached for something; she pretended not to notice him noticing. The time went quickly.

Still, Hayden couldn't stop thinking about the assassin-thing she had described. He wondered whether there were some way to pull the monster out of her, or poison or blind it. Aubri spoke no more of it, and he said nothing further about his own troubles. Perhaps out of a mutual need to turn their thoughts away, they focused with great intensity on comparing photos of Venera's map to the various charts. The charts were all centuries out of date. As the librarian had pointed out, the outer shells of the sargasso had been stripped away long

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ago, and the inner ways were char. It would take a miracle of navigation to find the treasure.

"I wish Gridde were here," Hayden said eventually. "He'd be able to sort all this out." As he said this he realized he'd felt a pang of affection for the crabby old man. Well, why not? Gridde was no soldier, he was just in love with his work. He was an innocent.

Finally they had compiled enough information to satisfy Aubri. "I think we've earned a break," she said. "There should be a restaurant near here, don't you think?"

They followed the librarian's instructions and soon found themselves back in the crowded sky of Vogelsburg. Distant Candesce was cycling into its evening phase, its light reddening slowly. Where the librarian had directed them, the air was so crowded with structures as to be nearly impassable. Blocks and spheres, triangles and loose basket-farms were jammed in together, all jostling for sunlight and air. People sailed every which way, and as they nearly collided they would reach out to push off from one another without rancor or pause. The air was full of the scent of cooking and of waste, as well as shouts and laughs overlaid with the distant, ever-present rumble of buildings grinding together.

Hayden had just spotted the wicker restaurant the librarian had recommended when suddenly Aubri clutched his arm. "Someone's following us," she murmured.

He restrained the urge to turn and look. "Are you sure? How can you tell in this crowd?"

"Because he followed us into the library. I spotted him dawdling in the history room when we were working. He was trying to see the maps, I'm sure of it. Now he's behind us again."

"Well . . ."

"He looks like one of *them*." He looked at her blankly. "One of the pirates!" she whispered.

Now he did contrive to glance casually behind him. Hayden spotted a shock of yellow hair moving through a swatch of sunlight and felt his scalp prickle with recognition.

"Come on." Hayden led them in a complicated path between buildings, just to see if their tail would keep up. He did, a constant in the churning flow of faces and clothing.

"Okay, forget about lunch. We'd better get back to the bike and tell the others about this." He grabbed a municipal rope to change his course; less gracefully, Aubri followed.

She touched his ankle. "Look, there's a police station. Should we. . . ?" Hayden wasn't inclined to trust the constabulary, but today might be a good time to make an exception. He grunted and they jumped in that direction.

"He's gaining on us."

"Wants to keep us from getting to the station, maybe?" Hayden didn't look around, but redoubled his efforts to get to the building, which was a cube built of stone and rust-streaked iron.

"He's right behind us!"

Hayden looked back, and hissed with shock: he recognized this man. He had been one of the two who had doused the *Rook's* crewmen with kerosene. Now he was only yards back, moving with great easy bounds between the buildings and carefully not looking at Hayden or Aubri.

The police station was just on the other side of a great crumbling apartment held together by rope and stretched burlap—but they weren't going to make it. "Fuck it," said Hayden; he grabbed the corner of the building and stopped himself. Then he reached for his sword.

The pirate dove toward him, but passed a good ten feet away, still looking the other way. "What the—" Hayden and Aubri watched in disbelief as their follower sailed on through empty air; with no ropes to catch and change course, he had only one possible destination.

"I don't believe it," said Aubri as the

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pirate disappeared into the funnel-shaped entrance of the police station. "What do you suppose that means?"

"I think I know exactly what it means," said Hayden as the entrance suddenly boiled with uniformed officers wearing powerful foot-fins. Somewhere behind the building he heard jets whining into life.

"We've got to get back to the bike!"

Aubri sat perched on the side of the apartment, staring at the cloud of oncoming policemen. "But what's—"

"He's working with them! Aubri, come on!"

"*Oh, I think you'll find it's too late for that*," said a familiar voice behind them.

Hayden spun around.

Captain Dentius stood on the building, not fifteen feet away. He was flanked by two policemen, and he looked very pleased with himself. "Hello again," he said in his grating voice. "It's always a pleasure to run into former clients . . . especially when you've got unfinished business with them."

"Bastard!" Hayden's anger finally had a focus. It was with something like joy that he drew his sword and leaped at the man, ignoring the policemen.

He spun until he was going feet-first and nearly managed to put his blade through the captain's throat, but Dentius ducked out of the way at the last moment. The policemen couldn't react before Hayden planted both boots on Dentius's chest and kicked hard. He sailed back to Aubri with extra momentum on his side. "Come on!"

She took his hand and they careered around the corner. Angry shouts followed.

"I can't believe you just did that!" she shouted. A gunshot sounded very close by, and here came the police bikes, a black swarm emerging from behind the police station.

"Take the initiative and you turn bad odds around," laughed Hayden. "First thing they teach you in pirate school!"

"Apparently Dentius skipped that class. Now what do we do?" They were trapped on the plain of the apartment block, with men closing in on all sides. There was just one obvious direction to go; Hayden smashed the wooden filigree of a window with his sword, and Aubri climbed in ahead of him as the police yelled at them to stop.

They found themselves in a strange apartment shaped like the cells of a wasp's nest. Shouts erupted from the half-dressed couple in the nearby bed-nest. Their limbs grotesquely long and curving, they looked like spiders as they reached out for any handy objects to throw at the intruders.

"Sorry!" Hayden and Aubri ducked past as policemen and pirates crammed into the window behind them.

Out in the tube-like hall, and Hayden saw doors opening in both directions. The shouting and shots had alerted the whole building. He and Aubri went as quickly as they could from rope-hold to rope-hold but in seconds all the doors were open, and the citizens of Gehellen poured into the air around them.

13

"That's a print from the second dynastic era of Keppery," said the courtier helpfully, indicating the garish splash of lime green and beige plastered like an insult on the banquet hall's wall. Venera was about to give some vapid reply (something on the order of "it's very nice") when she noticed what was happening near the doors.

"Excuse me." She sought out her husband, who was placidly sipping his fourth glass of wine next to Reiss. Gravity was taking its toll on them both. Venera leaned close and snapped, "They're locking us *in*."

"Wonderful news, dear," said Reiss obliviously. "The government of Gehellen has agreed to grant shore leave to your shipmates. Why, I believe if we visit the postern window over there we might even be able to see them disembarking."

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Chaison was staring over Venera's shoulder with a puzzled expression on his face. "I do believe you're right, dear. And who are those people who just came in?"

Without glancing around, Venera said, "Compact, nondescript faces, no expressions, efficient movements, simple clothing?"

"Why yes, how did you—"

"Father bought a few of those from Falcon Formation, if I recall. They're secret policemen, love, you wouldn't recognize them because of your appalling lack of education in certain areas." She kept the smile on her face—in truth, it was no more false now than it had been ten minutes ago. "We're about to be arrested, I believe, and our men are being herded off the ships."

Ambassador Reiss sputtered. "They can't do—"

"Think of something, fast," hissed Venera as she heard someone with slow confident steps approaching from behind. "Excuse me," said a voice that might have been stamped out of the same press as Carrier's.

Venera looked into Chaison's eye, and saw something she'd never seen before—he was furious in some silent and calculated way that he'd never shown her. They had been separated during the battle with the pirates but she had heard he'd shot some men from the *Rook's* hangar. The leader who had done that was not the man she bickered with over dinner, who gave in so easily on domestic matters that it drove her to distraction. She'd hoped to meet that man some day, but under better circumstances.

Chaison Fanning was about to kill someone. Venera realized that it was time for her to get out of his way. She began to step to the side, saw his eyes widen and felt a hand descend on her shoulder—

—And then a concussion sent her to her knees as stone and glass cascaded over her like water.

She looked up, blinking away dust, to see Chaison leaping over her as though she were a discarded chair in some bar brawl. A familiar roar filled the banquet hall, its presence here such a shocking violation of the order of things that it froze Venera in place for a moment. She whirled, one hand still on the grit-spalled floor, and saw indistinct figures struggling in a tunnel of spiraling dust. The stink of burning kerosene filled the air.

"Come on!" Hayden Griffin reached out of the cloud. His grim face and jacket's torn shoulder blazed into perfect clarity in a shaft of Candesce's light. Just as she moved to take his hand, however, he spun around and the sword in his other hand flashed a blur over her head. Someone screamed in the white opacity of dust that surrounded him.

"Officers to me!" That was Chaison's voice.

A pistol-shot startled Venera into standing up. Aubri Mahallan appeared, smoking weapon in her hand. "Sir, it's a trap," Griffin was telling Chaison. "Dentius got here ahead of us. He must have cut a deal with Gehellen for part of the treasure."

"Details later," said Chaison. "Officers, to me! We have to get back to the ships!"

Venera looked up. There was a jagged hole in the wall where the intricate stone and stained-glass rose window had been. "Ah," she said to no one in particular. "But what—?"

Something in the corner was rolling around belching fire and heat and the cloying odor of kerosene. Suddenly Venera realized that it was the black racing bike she had Griffin flying, and everything came together for her.

"You came through the *window?*"

Mahallan grinned tightly. "It was his idea."

A chaos of screaming men and clashing swords surrounded her. Venera was standing at the pivot-point of an actual sword fight, not one of those staged du-

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els from her father's house that ended in a scratched cheek. Men were dying. For some reason she was shaking, which hadn't happened even when she shot the captain of the *Rook*.

"How are we getting out of here?" she asked Mahallan. "Climb out the window and jump off the town? Then we're in the city, I guess we could fly back to the ships. . . " But Mahallan was shaking her head.

"We'd be easy targets in the open air," she said. "We have to get a vehicle."

"There." Venera pointed at the rattling, smoking bike.

"Not sure we can get it up to the window," said Mahallan, "and anyway, it'll only carry three."

Venera pressed her hand. "I'm sure you can hold them off long enough for Chaison and me to escape."

The armorer stared at her. "I'm going to assume that you're joking."

"Sometimes I don't know myself." Just then a wall of *Rook* officers reared into view out of the dust. They were being forced back by a mass of men pouring in from the opened doors at the far end of the ballroom. The Slipstreamers were already outnumbered three to one and it was just going to get worse.

"This is hopeless!" shouted the handsome one, Travis. His sword was bloody and his hair matted to his forehead. "There's a whole army coming the way we need to go."

"We need to clear that hallway," said Chaison. "Oh, for a rocket."

"How about a jet?" It was Hayden Griffin, appearing again out of the dust. This time his face was in shadow and he looked savage with his sword and ripped leathers.

He ran to the corner and dodged the angry lunges of the downed bike until he could grab its handlebars. Then he was in its saddle, feet skidding across the floor as he tried to manhandle it into submission. "Out of the way!" he screamed. Travis turned, yelled and grabbed the shoulder of the man next to him. They hit the floor exposing several startled Gehellen swordsmen.

"Aerie!" That wasn't the battle cry Venera had expected but she didn't care—the vision of Griffin opening the throttle all the way and shooting across the ballroom in a shower of sparks would stay with her for the rest of her life. Men flew through the air but the bike continued to accelerate as it crossed the hall. Venera screamed something that was half cheer, half obscenity, and reached for an enemy sword that had fallen at her feet. Travis and the other *Rook* officers were also screaming as they poured into the breach Griffin had made in the enemy's line.

The building shook to a deep *whoomp!* and a flash of light pierced the corridor down which the bike had shot. Mahallan gave a shriek and Venera thought, *so much for my driver*. But no, when they entered the corridor in a knot of *Rook* officers it was to find Hayden Griffin lying among the soldiers he had knocked aside. He levered himself to his feet as Venera placed the tip of her sword against the throat of an enemy who had the temerity to try to do the same. "Stay there," she said to the man cheerfully.

"Jumped off the bike when it cleared the doors," Griffin was saying to Mahallan. "Come on." He limped ahead. Mahallan just stood there for a moment, hands to her face.

Venera clapped her on the shoulder. "Well, what are you waiting for? Let's kill some men."

To her surprise Mahallan laughed and readied her pistol. "Yes!" They ran after the officers.

The end of the corridor was a mass of flame; the bike's kerosene tank had burst. Behind the flames cursing soldiers waited. Several fired random shots and one of the Slipstreamers went down with a bullet to the neck. Meanwhile Travis was vigorously kicking down the paneled side-wall a few feet from the fire. "This way!"

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They piled into what looked like a servants' corridor. Chaison indicated left with his sword. "But that's where the soldiers are coming from!" Venera objected.

"It's the way to the entrance," he said. "I'm not about to end the day with my back to a wall." He ran in that direction without waiting for an answer.

Startled servants jumped out of the way; they were almost comical with their stilt-like legs and frightened looks. Venera felt powerful and alive, galvanized by the knowledge that she was probably going to die here. For the moment, following her husband through shouting and screams, she didn't care.

He only had time for quick glances as they ran, but what Hayden saw of the Gehellen's servants' rooms was strange and disturbing. There were pulley systems that people raised gravity-free could use to glide from room to room. They passed one nine-foot man—who couldn't have weighed more than one hundred fifty pounds—dangling helplessly from one of these, weak feet scuffing the floor frantically as he tried to get out of the way. Nobody hurt him. There were lots of rolling carts, crutches and soft seats, and most of the side-rooms had big tanks of water in which men and women floated, exhausted, during their infrequent duty breaks.

"It's like a fucking hospital," muttered Travis as they passed a group of servants who cowered on their cots.

Gunfire ripped at them from up ahead. "They've blocked us," said Fanning with no trace of surprise.

Somebody cursed colorfully. Hayden turned to see an elaborately dressed man with a wine-stain birthmark gesturing from a side door. "This way, you fools!"

Fanning raised an eyebrow. "Well, follow the man," he directed.

This man, a dignitary of some sort, had circled around through unknown means and now held open a door to the palace's formal spaces. Hayden found himself in a huge atrium with curving staircases sweeping up to either side. The portraits on the wall were double or triple life-sized. Fanciful beasts were carved into the bannister posts. There was distant shouting, but so far no enemy feet had disturbed the deep red pile carpet. "Don't stand there gawking, up, up!" raged the dignitary. As he followed the mob of officers he added, "You might have thought to ask directions from the *one* man among you who's familiar with the layout of this place."

"Thought you were dead, Reiss" said Fanning with a shrug.

"In there!" Hayden allowed himself to be herded through a stout-framed door in the cavernous upstairs hallway. This brought him into a tall galleried library whose far wall was entirely composed of beveled-glass windows. There was only one other door and immediately some men ran to secure it. "Now where?" Fanning asked Reiss.

While the two talked and gestured, Hayden sought out Aubri. She was standing with Venera Fanning, who looked calm and composed as always. "Are you all right?"

Aubri nodded. "I honestly didn't think that window-crashing thing was going to work."

"I only did it because you didn't tell me not to. You're the technical one! I assumed you'd have said something."

"Oh."

Venera laughed. "You *have* to tell me how all of this came about."

Hayden was distracted by nearby shouting. Fanning was yelling at Reiss. "But we've got to keep moving!"

The ambassador stood his ground. "Admiral, sooner or later, we're going to have to jump off this town. There is no way to get to the docks. This library juts out from the edge of the wheel; it's the best jumping-off point."

"Trapped!" One of the men at the far door waved. "They're coming this way in force."

"This way too!"

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"Well, that's just splendid," muttered Fanning.

"Richard, what is going on here?"

All conversation stopped for a moment. Two richly dressed women, unnoticed until now, stood with fans in their hands in the center of the room. When Reiss saw them he blanched (winestain momentarily fading) and stammered, "L-Lady Dristow, what a surprise! I, I mean—"

The older of the pair strode forward, fan flicking above her robin's-egg blue bodice. "We came here hoping to have a quiet conversation, Richard. Not to be burst in upon by a covey of hysterical barbarians with swords." She looked down her nose at Admiral Fanning. "You are disturbing the peace, sir."

"Secure the doors," said Fanning. "And tear down those curtains! They might come in handy." Then he turned to the women. "Our apologies, madam. Circumstances have forced us to commandeer your library for a few minutes. I suggest you leave before the shooting starts."

"We will do no such thing!" The matron pointed her fan at the admiral, stabbing it rhythmically at him as she spoke. "Richard, tell this man how out of his depth he is. He does not speak to one such as myself. *You* must leave this place, sir, not I!"

The crack of a gunshot made Hayden jump. Lady Distrow shrieked as the fan she was holding exploded in a thousand flinders.

Hayden turned. Venera Fanning stood with one hand behind her back, the pistol straight-armed and aimed at Lady Distrow's head. "Shut," she said slowly, "up."

Chaison Fanning seemed to be suppressing a smile. "Reiss, do these women have hostage value?"

"Do these. . . ?" Reiss seemed to have lost the use of his voice. He shook his head, fluttered his hands at the ends of his arms, and then hurried over to take the shredded remains of the fan from the matron's fingers.

"We'll look into that later," said Fanning with a sigh. "For now, put them up top. Build a fort around them using books, it might stop a few bullets."

"What have you done?" squeaked Reiss.

"If we do have to jump, those curtains will have to serve as parachutes," continued the admiral. "I have no desire to tour the city at two hundred miles per hour."

". . . Just like the dream," Venera was muttering, her eyes wide and fixed on nothing.

"What have you *done!*" Reiss's anger had caught like a reluctant engine. He reared back, seeming to grow an inch, and his birthmark flushed deep red. "Twenty years I've been here, serving my country loyally. Letters I've penned to the Pilot, all this time—'Gehellen is a natural ally to Slipstream, we should increase trade connections'—slowly gaining these people's confidence and trust. Why, when I arrived they thought everyone outside of Candesce's light was a hopeless barbarian! It took two years just to set up my first cocktail party. And now you come sailing in here with a fleet of ships armed to the teeth, blow a hole in the palace wall and you ask me whether the Dowager Baroness of Cordia might make a good *hostage?*" He grabbed his hair and yanked it.

Venera shifted her aim and raised an eyebrow at her husband. Fanning pursed his lips and waggled a finger at her.

"Ambassador, if I even suspect that you led us in here in order to prevent us from escaping, I will shoot you myself," said Fanning quietly. Behind him, Travis was leading the matron and her cowering friend up the wrought-iron steps to the gallery.

"Admiral, I am loyal to Slipstream," raged Reiss. "Are you?"

"Unless I complete my mission, there will be no Slipstream," Fanning snapped. These words seemed to pene-

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trate Reiss's fury. He crossed his arms and turned away.

"So, we may have to jump," said the admiral. He strolled over to the glittering windows. "We'd best line up our trajectory, then."

Venera jammed her pistol into the silk sash of her outfit. "You were going to tell me what led up to this," she said to Aubri. Behind her the air was assaulted by the sound of shattering glass as someone knocked out some window panes.

Aubri described how they had been followed by what turned out to be one of Dentius's pirates, and then had encountered the man himself. Venera's eyes widened at the mention of the name; Hayden could see muscles tightening under the scar on her jaw.

She didn't hide her disappointment when Hayden told of just missing Dentius's neck with his sword. "You'll have to do better than that next time, Griffin!"

"Aubri saw an open window and dived for it," he continued. "They chased us through the building—we were just a few feet ahead of them at one point." In the pandemonium the building's residents had swarmed out of their rooms, "And we thought we were done for. But they started throwing furniture and cutlery back at the police! They made enough chaos that we were able to get away."

Aubri shrugged. "I guess the people don't like their authorities very much."

"Well," said Venera with a shrug, "if they're deliberately kept without gravity then why would they? Ugh, I don't like the image you're conjuring—like a nest of spiders."

The image was indeed apt, Hayden thought. The residents had stuck out long and warped limbs, had thrown chamber pots and boxes, and cheered when Hayden and Aubri made it out a window on the far side of the place. "This put us in a cavity made by six or seven jammed-together buildings; the police bikes couldn't get in so we were able to jump to another building and escape into a crowded marketplace. From the market we made it back to the library and my bike."

"We knew the reception here was supposed to run into the evening," added Aubri, "and we couldn't get back to the docks because the police were blocking that direction."

"Did you at least do the charting I asked for while you were out?" asked Venera. Both Hayden and Aubri glared at her. "What?"

"The sky's packed with bikes," said an officer who'd stuck his head out the broken window. His hair was all tangled and his eyes were watering from the force of the wind. "They'll pick us off with no problem at all if we jump."

"Please, we have to negotiate!" Reiss was clasping his hands together in distress. "Give them the information they need, Admiral, and we stand a chance of getting home again."

"Unacceptable." Fanning was staring out the window. He grabbed the man next to him and pointed at something. "Besides," he said, "there may be another way."

He ran over to the downed curtains and crouched atop them, gathering a handful and staring around at the other furnishings of the room. "Colors! I need the right color combination! And I need a man who knows semaphore like his own speech."

Travis leaned over the railing and waved. "I'm your man. What have you got in mind?"

"I can see several of our ships from here—the docks aren't that far away. There's people filing off them now, but I can't tell how many have disembarked. We need to get their attention and signal them. Are you up for it?"

"I'll need a bigger opening than that." Travis strode to the stairs, drawing his pistol. The gallery crossed the windows; methodically, Travis shot the panes out, showering leather armchairs and ancient side tables with glass. The wind

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from the palace's rotation tore at the leftover edges, growling and hissing like some monster trying to get in.

"Slipstreamers!" The voice came from the main hallway, beyond the barricade of stout tables and bookshelves that Fanning's officers were completing. "This doesn't have to end in bloodshed! You know the information we're after. It's ours by right, just as Leaf's Choir is ours. Give it up and I promise you'll be unharmed. You'll be escorted to the border and freed, along with your ships."

"You see," exclaimed Reiss. "Admiral, these are civilized people. They'll keep their word."

"Civilized people don't lay traps for visitors," said the admiral. "But tell him we're seriously considering his offer. It'll slow them down, and give you something to do." He turned to the others. "I want a salvo out that window. The sound has to carry to the ships, so every available man put his pistol outside."

They began firing, while Travis stood on the gallery overhead, waving makeshift flags as the wind tried to pull him out of the building. Meanwhile Reiss stood by the barricaded door and stammered out a wonderful string of vague promises and apologies; even Fanning had to smile at his tortuous negotiating style. "The man could buy us an hour at this rate," he said.

"Sir, something's happening at the docks." Fanning ran back to the window. "Everybody quiet! Listen." Travis stood stock-still, his hair fluttering in the wind. Faintly, through the constant roar of the air, Hayden could hear a distant, irregular pop-popping sound.

"Gunfire! And some sort of commotion by the ships. I think they're trying to cast off."

At that moment the Dowager Baroness of Cordia stood up and shrieked, "It's a trick! They're just trying to buy time, you dolts. You're letting them get away."

Venera spun and fired. The Baroness fell back with a cry. Then the main door's barricade shuddered under an explosion that knocked paintings off the walls and books out of the shelves. The heavy tables that made up the barricade stepped forward several feet, knocking some of the defenders aside in a spray of smoke and splinters.

Fanning leveled his pistol and fired into the cloud. "Shore that up!" The Gehellens had misjudged the amount of powder it would take to blow the barricade, but next time they were likely to overcompensate. The door was going to open soon no matter what the Slipstreamers did.

"They're moving! The ships are moving!" A cheer went up at this announcement. The door defenders were back on their feet and using up the last of their ammunition to prevent anyone coming through as they shoved the smoking furniture back into the gap. It was too late, though—blades and bullets shot out of the smoke, taking down two of the officers.

Fanning stood on a central table and pointed with his saber. "Cut up those curtains. I want parachutes."

Men were smashing out the remaining panes of glass on the library's lower level. The wind now had free reign and it began sucking up everything—shards of glass, glowering portraits of Gehellen royalty, the buzzing pages of books. Gunfire ripped through both barricades scattering the men there. Somebody screamed, "They're coming through!"

Suddenly the younger of the two Gehellen women leaped onto the gallery bannister wailing incoherently as she leveled a gun at the people below. The hand of the man left to guard her hung limply through the bannister posts. She aimed at something over Hayden's head and fired, the recoil causing her to lose her footing. She fell off the gallery into the chaos of broken furniture and Hayden turned in time to see Travis, clutching his shoulder, stagger into the embrace of the wind and be snatched away by it.

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Through the howl of the wind Hayden heard someone yell, "The *Tormentor* is coming," just as the barricades fell and armed men leapt into the room. Fanning leaped off his table and ran for the windows. "Junior officers first, get ready and line up your jump!" He handed large swatches of torn curtain to the young men then pushed them at the window. That was all Hayden had time to notice before he was faced with a grinning enemy with a sword and had to parry a cut to his throat.

The Gehellens were weak. It took long seconds for the fact to register with Hayden. As he cut and parried he realized that he outmatched his opponent in both strength and speed and that the same was true in the other duels being fought around him. Gravity was a precious commodity here, metered out unwillingly by the upper classes. These soldiers hadn't trained nearly enough in it.

He sent his opponent down with a slice to the ribs and turned to the next one. For a few seconds there was only the narrow world of slash-and-dodge; then someone screamed his name.

Glancing around, he saw Aubri holding one hand out to him. She stood next to the window with several others; in one hand she clutched a crimson swath of curtain. Hayden cut madly at the man he fought, then dove back to take Aubri's hand. She pulled them both out the window, and the library, the palace, and the royal town of Gehellen swept up and away at awful speed.

14

Snarling bikes trailed banners of vapor through the city. Chaison Fanning expected bullets to strike him any second; he focused on holding onto the corners of the scarlet curtain that fought to leap out of his hands. This close to a town wheel, there was usually a zone of empty air for safety reasons; if only he didn't lose the sheet he might be able to slow down to a reasonable velocity before he plastered himself against some window in the weightless part of the city.

The riveted iron belly of the royal town wheel receded with alarming speed, but he could see no puffs of smoke to signify that his people were being fired upon. In fact, he heard no shots at all now, just the bikes and the juddering of the wind.

One bike slid across the air towards him. *Here comes the end*, he thought. But as the can-shaped jet closed the last few feet to run parallel with his fall, he saw the Slipstream crest on its side. Its rider leaned over and held out an open palm for him to catch.

Chaison let go of the recalcitrant cloth and grabbed at the offered hand. It took a while to make the catch but before he expected it he was astride the hot metal cylinder, hanging on with white knuckles while he tried to jam his feet into the passenger stirrups.

Everywhere he looked, bikes were picking up falling officers. He even spotted Venera by the color of her clothes as she wrapped her arms around the waist of her rescuer. In the middle distance—between the bikes and the tumbled shapes of the city—six battered cruisers were circling.

He clapped his driver on the shoulder. "The *Rook*, if you can."

"Yes, sir." The man hunched forward and they took off. "That's a mighty fine dress uniform if I do say so myself."

"One of the things they give you when you get to be admiral," yelled Chaison over the wind.

"Yeah? What else they give you?"

"Headaches!"

With a few seconds to spare, Chaison examined the tactical situation. A navy's worth of bikes, cutters, and strike boats was stitching just beyond the Slipstream ships. And at the naval shipyard, a dozen battleships at least were casting off their moorings. But so far, nobody had fired a shot.

"They're afraid we'll blow up their city," he said. Indeed, the Slipstreamers' rocket racks were all open and aimed,

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some at the palace.

Chaison began to smile.

The bike dropped him off at the familiar hangar; the hatch gang gawked at him as though he'd returned from the dead as they helped him inside. "Senior officers to the bridge as soon as they arrive," he said to them. "Prepare to get under way."

There was no way everyone had made it back on board. If the fight at the docks had gone the way it had looked, a sizeable knot of Slipstreamers might have been left behind when the ships lifted off. This presented Chaison with a bitter decision, and he considered it unhappily as he hand-walked up to the bridge.

"Admiral on the bridge!" He ignored the jubilant cries of the staffers and strapped himself into the command chair. He was sitting thus, glowering, when the wounded and adrenalin-fired officers began straggling in, laughing and shouting and embracing one another. To his astonishment, Travis was with them, pale and clutching his wounded arm, but otherwise intact.

Trailing them all came Ambassador Reiss, who appeared to be in a state of shock.

"Listen!" Chaison hammered the arm of the chair to get everyone's attention. "We have about one minute to make a major decision. We have a choice now. I understand that some of our men are still at the docks and maybe scattered through the city if the bikes didn't get to them in time. We can recover all of them if we take a stand here and threaten to blow up the royal palace of Gehellen."

He had their full attention now. "Now, with luck and a little negotiation, we might then secure an escort to the border and escape this nest of traitors. But during all the talking and threatening, the Gehellens will have plenty of time to deploy their ships to best effect. We will have to give up any hope of reaching Leaf's Choir."

"Then they'll have won!" wailed a junior staffer.

"But we'll have our men."

They looked at one another unhappily. "On the other hand," continued Chaison, "if we abandon the stragglers, we can set a course directly for the Choir. The Gehellens will give chase and there may be a running battle, but at top speed the sargasso is only an hour or two away. Once in it we can hide—and hunt for our objective."

The door opened and Aubri Mahallan entered. Her harem pants had ballooned and ripped in the fall, her hair was a mad tangle and her eyes were red—but she looked calm as she presented Chaison with a leather folder. "Best guess for the location of the treasure, based on the maps we found in the library," she said.

All eyes were on the folder as Chaison opened it. He noticed that, and half-smiled. "It seems," he said, "that we all know what we have to do. Perhaps later we can repatriate our men by offering the Gehellens some of their treasure back. Anyone here want to pledge a tithe to that purpose?"

Everyone shouted "Aye!"—Everyone, that is, except Richard Reiss, who merely hung his head.

"Good," Chaison said with satisfaction. "Make the same offer to the general crew, and get these ships under way! Maximum speed, use rockets to blow any obstacles out of the way—and prepare to lock down for sargasso running!"

In that small space, the cheer was almost deafening.

Candesce was fading as the Rook and its sisters lofted past the last pendant towers of the city. The mauve and rose-colored sky went on forever, its perfect symmetry broken by the glitter of countless home and town lights. The air was dense with rope highways and navigation beacons, vast and diffuse farm nets and weaving flocks of fish and birds. The ships did not slow down for any of these hazards; in fact, they accelerated

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into the dimming air, recklessly daring fatal collision with stone, water, or tree. The entire home guard of the Gehellen navy came screaming after them with only a little more caution.

Far in the distance, veiled by evening color, a vast black smudge polluted a full thirty degrees of sky. The Sargasso of Leaf's Choir ate all the light shone at it, and cast an indigo shadow across hundreds of miles of air. Minor wars had been fought over the significant zone of Winter caused by that shadow; among the principalities of Candesce a significant minority favored the idea of towing Leaf's Choir into a final incineration at the central sun. The majority was horrified at the prospect of smothering the sun of suns in that much ash, and predicted dire consequences from prolonged darkness, and as the purified residue fountained back up. Arguments about what to do with the Choir had sea-sawed for centuries.

No one had ever seriously suggested that the Choir be sent the other way, into the outer volumes of Winter. To dispose of the sargasso among barbarians would sully the memory of one of the greatest nations of Candesce.

For all Chaison Fanning's intentions, there was no way that the expeditionary force could reach the Choir in only two hours. Darkness and the crowded air slowed them, forced detours and unpredictable maneuvers. Rockets began to appear from behind, red streaks zipping past in ominous silence as Hayden held the handles next to a porthole and stared out at the dark. Any second now an explosion might convulse the *Rook*; and yet you could only take so much fear. He watched as long as he could, but eventually drowsed, and dreamed confused half-dreams of Aerie, his parents, and the destruction of their half-built sun.

The impressions stayed with him even as he woke to find someone shaking his shoulder. "Armorer wants you," said a crewman. Hayden grunted his thanks and levered himself away from the window. The thrum of the engines continued; apparently they weren't dead yet. But it was impossible to tell where they were or how long this chase would last.

As he made his way through the ship he saw men sealing portholes and cracks with thick gummy tar. Others were hooking hydrogen peroxide tanks to the engines and checking the air distribution hoses, preparing for sargasso running. There was little conversation, just a muted hum of urgency.

It all seemed reassuring, somehow. Without noticing, he had come to think of the *Rook* as his home—and it was hardly surprising. Hayden hadn't had a home in many years; certainly the various bug-ridden flats and one-room bachelor's nests he'd slept in hadn't counted. He had been alone for so long that he'd forgotten what it was like to be among friends. But the atmosphere of the *Rook* reminded him of Gavin Town. Ironic that it was a ship of the enemy.

He passed Martor, who slept strapped to a beam just behind the hangar. The boy looked the child he was—totally innocent in sleep. A few hours before he had told Hayden about the fight at the Gehellen naval shipyard. The Gehellens had begun offloading the crews along a narrow metal scaffold, a barred cage with troops hanging in the air outside of it. It was a shooting-gallery, really, had they all been in it when the shots from the palace had been heard. Luckily there were still men in the ships able to man the rocket racks, and they had blasted the troops who had tried to disengage the cage and sail it away to a nearby blockhouse. Men had spilled into the air and a fierce swordfight erupted. Martor had described this in his usual way, waving his arms and making stabbing motions. But his heart didn't seem in it; he'd known men who had died in this battle and he seemed to be beginning to realize what real death meant.

Hayden turned away from the boy, shaking his head. No—these people

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weren't the enemy, no matter what their homeland had done to his. Aerie deserved its freedom, and Slipstream as a nation deserved to be knocked down. But the people of Slipstream and the people of Aerie deserved equal respect and consideration. They were only human, even the loyal crewmen of the Slipstream navy whom he now counted as friends.

Somehow, he mused, there must be a way to separate the political from the personal. His bitterness over the past years seemed increasingly to have come from not believing that such a thing was possible.

He passed one other person on his way: the forlorn figure of Richard Reiss curled up next to a porthole, where he watched the skies in mourning for the life of luxury and prestige he had so suddenly lost.

Hayden rapped on the door to Aubri Mahallan's box-shaped workshop. The wooden panel squeaked open an inch, then widened, letting loose a fan of lamplight. He squeezed inside and the silhouetted shape of Aubri shut the door behind him.

And latched it.

"What can I do for you?" He reached out and somehow she had swirled closer and his outstretched fingers slid up her arm and onto her shoulder—which was bare.

He started to snatch his hand back but she held it, and now his fingers strayed onto the smooth soft skin of her pectoral. "You stuck with us through everything," Aubri murmured. "I thought you needed some sort of reward."

With the permission of her fingertips on his wrist, his own fingers slipped further onto the satin slope of her breast. With a simple scissoring motion Aubri reached around his waist with her legs and drew herself to him. His other hand reached down to cup her hip and encountered warm skin.

"Now we must be very, very quiet," she whispered. "Or we'll be the crew's main topic of conversation for days."

"Um," he said; but then she was kissing him, and he was spared having to think of any clever replies.

Spotlit by smoking electric torches, men braced themselves in the hangar doors of the ships and waved flags at the dark silhouettes of their sister vessels. The flags fluttered and buzzed in the fearsome headwind, but the messages that flickered across the rushing air were clear and measured. Encoded status reports, inventories, updates to the chart numbers, all flowed steadily between the members of the force, routine and controlled.

—Until one message to the *Rook* caused the duty officer to curse under his breath. Reluctantly, he sent Martor to knock on the admiral's door.

Hayden Griffin was drifting in a timeless haze of pleasure in Aubri Mahallan's arms when the *Rook* shook from some sort to collision. They were both instantly awake. There was another bump and then the grating sound of hull-against-hull contact. Hayden heard shouting.

Aubri's eyes were wide. "We're being boarded!"

He shook his head. "No gunshots. Something's up, though." They both hastily dressed. "Stay here," he said. "It might be the Gehellens after all."

She shuddered. "If we really are being boarded, I'm going out the window this time."

He flipped out the doorway and closed the portal, immediately encountering Martor. "Come on!" shouted the boy. "We're taking on passengers." He bounded back towards the hangar.

The *Rook* and the *Unseen Hand* were lashed together, door to door. The ships bucked and strained against the ropes and wind whined through the gap. Men were leaping between the ships carrying boxes and rockets. The *Rook's* new boatswain yelled and pointed, face red and sweating, as crates and bedrolls bounced and tumbled through the air.

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"What's going on?" Hayden asked one of the *Unseen Hand's* crewmen. The man grimaced and waved at his ship.

"Oxygen system's busted. We'll suffocate if we take the *Hand* into that place right now. Admiral ordered us to transfer over to the *Rook*, leave a skeleton crew on board. With fewer people breathing over there, they might stand a chance." He looked around at the crowded interior of the *Rook*. "Where can I strap my bedroll?"

"Martor, take care of him," said Hayden. He headed for the hangar doors, intending to help with the transfer. Glancing forward between the ships, he was startled to see nothing but blackness ahead of them. "Where are we?"

"Hard to say," said one of the hatch gang. "Word is that it's too dark for sighting and we don't know the local navigation beacons. The sargasso could be ten miles away, or we might be about to run into it at full speed."

Hayden spent a few minutes jumping back and forth between the ships carrying supplies—crates of food, coils of rope and rolls of canvas for the braking sails. He was untying a barrel of hydrogen peroxide near the back of the *Hand* when the shouting in the hold took on a hysterical edge.

"Cast off! Cast off! Just cut it!" Hayden let go of the box and bounded up to the *Hand's* hangar. Men were frantically slashing at the ropes that bound the two ships together. He opened his mouth to ask what he could do to help, and was drowned out by the sound of both ships' collision horns going off. "Brace for impact!" someone screamed.

Something like a giant black claw swept through the narrow space between the ships. One crewman who had been jumping the gap was suddenly gone. At the same time, both ships lurched and a series of loud rattling bangs shook the *Hand*.

"We're in the trees!" They had reached Leaf's Choir; apparently the navigators had misjudged the distance after all. More bangs, rattles and cracks signaled impacts with the charred branches of the former forest. The *Hand* shuddered and began to slow.

The gap between the ships suddenly expanded. Hayden realized he was holding tight to a beam aboard a vessel that had no oxygen supply. Everyone he knew was on board the *Rook*, including Aubri. In seconds they would be separated and he might never see her again.

He spun and put his feet against the beam. Looking up he saw the square of light that was Rook's open hangar door. Men crowded there, but only one was looking in his direction. It was Carrier.

For a moment he and Venera's servant locked gazes. Hayden saw Carrier hesitate—just for a second—and then he extended his hand.

Hayden jumped. For a second he was in turbulent air, surrounded by lashing black branches and the scent of charcoal. Then Carrier had him by the wrist and was pulling him into the *Rook*. The hatch gang cheered.

Carrier let go and turned away. The boatswain pushed Hayden toward the inner door while shouting "Shut the hatch! Tar it! Stand by for sargasso running."

Hayden looked back as the hatch closed. Carrier had disappeared. Through the closing hatch he could see the lights of the *Unseen Hand* flickering through a chaos of whipping branches. The *Hand* veered away, its light guttered and was lost; then the hatch slammed shut and the gang moved to seal it.

They had reached Leaf's Choir.

Most of the Gehellen vessels fell back to circle the black forest in frustration, but some sargasso-equipped ships continued to follow the Slipstreamers. This made it risky for the *Rook* to slow down—but it was equally risky to continue at speed. The outermost layers of Leaf's Choir had been picked over by charcoal harvesters for centuries, and now consisted mostly of long spear-like

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trunks, denuded of branches, that wove and curved through the air for hundreds of feet at a time. These spears could puncture the hull of even an armored warship, if struck at high speed.

Each tree had originally been rooted to a small clump of asteroidal dirt. As they grew they wound branches around one another, like swimmers grasping for companions. With no sense of up or down, the trees had used Candesce and the local suns as their targets, sending threadlike stalks and branches through the empty air, spreading nets of leaves to catch light and passing moisture. Gradually, they had formed a vast and diffuse substance that made its own weather, caught drifting dust and stones and assimilated them, and greedily sucked up the carbon dioxide and smoke of the industries that thrived among them. Humans had woven the pliable branches into elaborate structures, entire cities of living green that went on, chamber by beautiful breathing chamber, for miles. Generations of gardeners cultivated their home trees, adding flowers and liana. Giant spheres and rods of water filled the central spaces, cupped by a thousand delicate fronds, in which fish and people swam. The people of Leaf's Choir had cleverly fashioned gigantic mirrors out of water—simply by stretching nets and wetting them until the water clinging to neighboring strands met and merged into a single surface—and used these to reflect the light of Candesce and their own two suns many miles into the forest.

All of it had burned. All was now black and sunless, the air replaced by stagnant smoke that never settled, merely eddied and spiraled around itself in an eternal dance of mourning.

The ships's navigators soon started cracking under the strain of finding their way through this gargantuan, maze-like tomb. They spent hours staring out at the advancing lines of black lit by the ship's headlights. Odd objects would appear in the light and slide by like hallucinations: window lintels, blackened shoes, spoons and bedposts. The men began to swear they saw figures beckoning to them from the darkness beyond the branches.

And all the while, the Gehellens followed.

Chaison Fanning locked himself in the chart room with Gridde and Aubri Mahallan. They compared photographs of the measureless spaces and distant, branching buttresses of forest growth to the charts Aubri had found in the library. The precious treasure map from the tourist station waited in a glass case beneath the chart table. "It all hinges on finding the city of Carlinth," Gridde said over and over. "Find the city, we can find the rest of the way. If we don't . . ."

There were reports of men collapsing suddenly. Unless the air was kept moving, carbon dioxide, monoxides and smoke from outside seeped in and pooled. You could put your head into an invisible cloud of death without knowing and just pass out. It was as though some unseen monster stalked the ship. Everybody watched everybody; nobody slept unless their face was near a fan.

Dangerous as it was, some men found themselves obsessively watching out the portholes. Hayden was one. He had no duties since the bikes were useless without oxygen. Though he hungered to be with her, Aubri was busy with the charts. The only way he could feel he was contributing was by maintaining some sense of where they were.

Of course he'd heard of sargassos. They happened whenever a forest became too large and caught fire. Normally, though, a sargasso didn't last long. Air moved through it chasing the smoke away. The charred raft of branches broke up or was taken apart and everything went back to normal. It was terrifying to think that a forest could become so large that its sargasso could never be healed. As he watched he thought about the fact that an entire civilization was entombed here in the dark: the *Rook*

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hummed past chalk-white stone house cubes and blackened town wheels where only ghosts now dwelt.

There were hints in the lines and buttresses of the forest that Leaf's Choir had once been a realm of grand sculptured bubbles made up of smaller bubbles, a fractal palace with living walls. At times the perspectives became dizzying. Miles-wide chambers and arches had walls made up of buildings—houses as bricks, towers as pillars, the city as building material. It was almost reassuring that their full extent was no longer visible; the grandeur, and the feeling of loss that must go with seeing it, would be unbearable.

At times it seemed as though the *Rook* had entered some other plane of existence. Home, friends, ordinary cares no longer existed. There was only the breathing of the pumps and the distant roar of the engines. Faces were side-lit or merely imagined on silhouetted figures passing between the active work stations of the ship. And maybe this otherworldliness was what caused the crew of the *Tormentor* to let down their guard.

Hayden didn't see the missile itself. The *Tormentor* was somewhere out of view on the other side of the *Rook*. He did see a row of distant house windows, previously black, light up in lurid reds one after another—a quick whipcrack motion from right to left—and then the ghostly network of dead branches was thrown into stark relief by a burst of white light.

The roll of thunder followed moments later.

The illusion of peace was shattered by shouts, warning horns and furious activity. The porthole suddenly moved away from Hayden as the *Rook* began to roll over. "Running lights off!" the boatswain was shouting. "Headlight off!"

"What are we doing?" demanded the airman from the *Unseen Hand* who Hayden had spoken to earlier. "Aren't we going to stand and fight?"

The boatswain shook his head. "Admiral's orders. The others are going to draw them away while we make a run for the treasure. Don't worry. He planned for this."

"He plays fast and loose with our lives," muttered the crewman.

"Right here, right now," replied the boatswain, "caution'll get you killed."

Roars and rumbles could be heard through the hull for many minutes, but the light of battle faded behind quickly, and eventually the relentless silence of Leaf's Choir settled back over the ship—worse than before, if that were possible, because the *Rook* was barely moving now. The navigator and pilot sat with their noses to the bridge portholes, staring into the darkness until their eyes watered. Occasional thumps on the hull and the sharp snap of breaking branches signaled their mistakes. The ship would shudder at such times and slow, and the fire crew would rush around looking for broken seams, cracks or punctures—anything that might let in the toxic mix that passed for air in this place. It was fully two hours before the admiral allowed the *Rook's* headlight to be lit again.

By that time, Hayden was certain they were lost.

Chaison Fanning had begun to feel unpleasantly familiar with the back of Gridde's head. The old man had his eye glued to the periscope in the chart room and hadn't moved in ten minutes; Chaison suspected he was asleep. Would that Chaison could be.

He was hiding here, he had to admit. It was just too nerve-wracking to be on the bridge right now. After all, the entire mission—and possibly the future of Slipstream itself—was riding on the events of the next day. Or rather, no, it wasn't the direness of the situation that was keeping his nerves on edge. He'd already fought several battles to get here, and none had affected him like this interminable waiting. No, it was the prospect

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of being proven a fool that bothered him. In all likelihood there was no pirate treasure; the very phrase was an oxymoron, for pirates were outcasts, the poorest of the poor.

If it turned out that he had betrayed his men's trust by luring them halfway across the world on a bootless quest, Chaison would willingly step out of the *Rook's* aft hatch without a gas helmet and make Leaf's Choir his tomb. Or give himself up to his men's wrath. It wouldn't matter which at that point.

"There it is!" Gridde had been awake after all. He said nothing else, until Chaison put a hand on his shoulder and said, "What, man? What do you see?"

"It's the city," the old man whispered. "Dead as a forgotten legend.

"Your wife's map starts here. From here, I can find our way."

Chaison went to one of the portholes to look out. There had been nothing but relentless black out there for hours now as the *Rook* searched for landmarks in the open central cavity of the Choir. Once, two suns had lit this space, but it had shrunk until it was only fifteen miles across. Cities, farms and palaces had soared through the luminous air. Now, any light you made was quickly eaten by the permanently drifting smoke.

Impatiently, he bounced over to a speaking tube and said, "I want flares, in all six directions. Air-free white." He waited impatiently by the porthole until the lights stuttered on.

And a ghostly image began to emerge from the frozen billows of smoke and killed air: the bone-white shape of a city, its arcs and curves embedded in shadows of perfect black.

This was Carlinth, once the second-largest city of Leaf's Choir. As Chaison examined it he realized he was looking at one of the legendary architectural forms of the principalities of Candesce. Carlinth was a geared town.

Six town wheels surrounded a seventh like the petals of a flower. Their rims touched and an elaborate scaffolding, shadowed behind them, indicated some fixed connection between them. When they turned, they would have turned in synchrony. You could step off one wheel and onto the rim of another—no cable cars for these people.

Each town wheel was twice the size of any of Rush's. They were crowded with mansions and minarets, and many more free-floating buildings hung in the surrounding dark. But it all looked unreal, like an ivory child's toy, because there was no color at all to the scene. Every object and structure was the same shade of purest white.

Gridde hissed as he squinted through his periscope. "It's ash, sir. Finer than smoke, it's like paint when it settles. The whole place is layered in it."

A shroud, thought Chaison with a shudder.

"But I can see the way," continued the chartmaster. He held up the long branch-like map Venera had taken from the tourist station. "I can navigate us from here."

The knot in Chaison's stomach began to unwind, just a bit.

The *Rook* slid silently past the dead town wheels. Just as the flares began to gutter Chaison began to catch glimpses of discolored areas on the motionless structures, places where objects had been removed, doors forced and windows broken. Someone had come here to strip the dead city, but whoever it was had not come in force and hadn't stayed long.

Was it ghosts that had scared them away? Skittering sounds in the darkness, half-glimpsed movement down streets that had once thronged with people? Or was it just the silence, relentless and oppressive, that had made men begin by talking in whispers and end up not speaking at all?—Leaving, abandoning their ambitions of getting rich off the death here; shamed and uneasy, fleeing Leaf's Choir never to return?

Carlinth perched on the tip of a four mile long outthrust of foliage. As the

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beam of the *Rook's* headlamp grazed this bleached tangle it became clear that the fires had not reached the city. Perhaps through some heroic effort, the citizens of Carlinth had fended off the flames; if so, they had only postponed their fate as the air turned foul and smoke invaded from all directions, sliding under doors and through cracks until eventually everyone succumbed. He could only imagine the tragic tableaux that must still be on display in bedrooms and plazas throughout the city.

The unburnt forest was a porcelain filigree full of infinite detail; but Chaison was tired, and happy to leave the navigation to Gridde. He retired to his tiny cabin on the *Rook's* wheel to find Venera sprawled diagonally across the bed, snoring. When he tried to move her she awoke, grinned raffishly at him, and drew him down. Their love-making was passionate and tender; all the words that stood between them during the day were erased by moments like this. They reaffirmed their loyalty to one another through caress and kiss, and said nothing.

When he awoke it seemed as though no time had passed. Venera was asleep. At least, he assumed it was sleep, and checked her pulse just in case. You never knew, with the pernicious gases that were lurking about.

The chart room stank of unwashed old man, and Gridde looked deathly ill, but he was still at his post. "Nearly there," he said hoarsely. His right hand clutched the end of a speaking tube and he alternated between sighting along the branch-like map, and peering through the periscope. His eyes, when Chaison saw them, were hollow but burning with fierce intensity.

"The map works?" Chaison couldn't keep the surprise out of his voice.

Gridde laughed, a rattle like water through old pipes. "Get up to the bridge, boy. We can't be more than a half hour away now."

Chaison grinned. He did feel like a boy, responsible to no one but himself. He was hungry—better get a meal sent up. He resisted the urge to laugh out loud. *It's working!*

On the way out of the chart room he paused to glance out the porthole, and gasped.

Color had returned to the world outside the *Rook*.

Here, the forest had not burned. Stifled and enmeshed in darkness, the trees had died slowly. It could be that one of the little suns had continued to burn for a time after the fire, because the myriad leaves now swirling past the *Rook* were all autumnal, like those of a forest that had strayed too far from its sun. They blazed red, shone gold, or were touched with delicate browns and tans. Little clouds of them danced in the vortex caused by the *Rook's* passage. The tunnel of foliage down which they were travelling was dappled in rich hues that burst into view as the headlight caught them, then faded to black as they slid past.

It was a mesmerizing sight; but he couldn't dally.

Chaison made sure he was well groomed and had a confident air as he entered the bridge. The bridge crew looked up blearily, then snapped to attention. "Sound general quarters," he said as he strapped himself into the captain's chair. "I want the excursion teams suited up and ready to go." He thought of sending someone to wake his wife, but an unfamiliar but pleasurable spitefulness stopped him. Let her sleep through the discovery. It would serve her right.

For a while he presided over the rousing of the ship. Ultimately he couldn't resist, though, and returned to a porthole to watch. And so he was one of the first to see it as they rounded a knee of forest that almost blocked the vast autumnal tunnel, and the fabled Treasure of Anetene hove into view. ■

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The Eternity Artifact, L. E. Modesitt, Jr., Tor, $25.95, 367 pp. (ISBN: 0-765-31464-9).

A Gathering of Widowmakers, Mike Resnick, Meisha Merlin, $24.95, 263 pp. (ISBN: 1-59222-085-1).

Lady with an Alien, Mike Resnick, Watson-Guptill, $15.95, 156 pp. (ISBN: 0-8230-0323-X).

Building Harlequin's Moon, Larry Niven and Brenda Cooper, Tor, $25.95 (ISBN: 0-765-31266-2).

Edenborn, Nick Sagan, New American Library, $12.95, 325 pp. (ISBN: 0-451-21527-3).

Learning the World, Ken MacLeod, Tor, $24.95, 303 pp. (ISBN: 0-765-31331-6).

Singer of Souls, Adam Stemple, Tor, $22.95, 237 pp. (ISBN: 0-765-31170-4).

Once Upon a Time (She Said), Jane Yolen, NESFA Press, $26, 378 pp. (ISBN: 1-886778-61-2).

Author L. E. Modesitt, Jr., has been looking at the future in an interesting way for many years now. He hasn't quite been writing a future history (in some books the galaxy has aliens for humans to interact with; in some it doesn't), but the themes persist. He splits humanity into those who fail to understand where lack of restraint in breeding and resource use must lead, and those who do; into those who put faith before reason, and those who don't. Perhaps not surprisingly, he matches up the first members of each pair.

The pattern remains in **The Eternity Artifact**. This tale's galaxy has no aliens, which sits quite well with the religious zealots of the Covenant worlds. The Comity, however, is extraordinarily delighted to discover a pair of strange worlds, Chronos and Danann, whizzing through space outside the galaxy. Chronos is a perfect, shiny, high-density sphere. Danann bears what appears to be a city of towers, many billions of years old, immersed in frozen atmosphere. So the Comity converts the *Magellan*, a huge colony ship, by giving it battleship engines and armament, drafts a crew of excellent if sometimes misfit techs and shuttle pilots (etc.) and a corps of assorted academics. Among the latter is Liam Fitzhugh, a specialist in historical trends possessed of an interestingly useful past. There is also the artist Chendor Barna, whose eye proves astonishingly apt at pattern analysis. For the crew, meet Jiendra Chang, working in a dead-end job because of a talent for breaking fingers, but known to be a very competent shuttle pilot; she has her own kind of pattern analysis skills, and in due time, she and Liam will find each other interesting. And then there is John Goodman, assassin and saboteur, inserted as a weapons tech with orders to build a certain device.

Shortly after the *Magellan* launches and well before it hits the first of the Gates on the road to Danann, enemy ships attack. If the presence of a saboteur was not evidence enough that groups such as the theocratic Covenan-

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ters saw a threat in the expedition, here was enough more to convince anyone. The possibilities—chiefly inconsistency with religion and a sudden infusion of alien technology and power into the Comity—could alarm anyone, and apparently they have, despite the extreme secrecy surrounding the mission. It isn't long before assassins strike aboard the ship and Liam displays unsuspected talents. More than one force is out to stop them, but look! Here's Danann now, thousands of towers embedded in the ice and frozen-out air. To the explorers' dismay, once they break through the doors, they find nothing but empty rooms. The greatest reward may be just the material of which the towers are made, for it is strange stuff indeed.

Or is something else going on? Beneath the ice, power sources are revving up. Heat is being generated. And enemy flotillas are appearing in the distance. Secrecy hasn't worked very well.

Aboard the *Magellan*, Liam and Jiendra are . . . They aren't generating much heat. Their pasts have left them heavily defended. But they are thinking that just perhaps some barriers need to be lowered. Unfortunately, Jiendra is a pilot, and when enemy ships start shooting, she has to be out there, shooting back and exposed to very slim odds of survival.

The book's an adventure yarn in the BDO (Big Dumb Object) tradition of Reed's *Marrow* and *Well of Stars* (reviewed here last October) and Clarke's *Rendezvous with Rama*. It is also a meditation on what motivates fear of the new. And it's a low-key romance that is realistic enough to make *The Eternity Artifact* stand out in the constellations of BDO and hard science tales, whose characters are generally much less alive.

There's something for everyone here—perhaps even enough to cop an award or two. Enjoy!

It's been far too long since I had something (*Return of Santiago*, November 2002) by Mike Resnick to review, but here's a pair, with more coming. The Widowmaker trilogy will appear as an omnibus from Meisha Merlin, but first we get **A Gathering of Widowmakers**. You may recall the Widowmaker as a famous bounty hunter who developed a fatal disease. To finance his cryogenic wait for a cure, he had to have himself cloned. The first clone didn't last long, but the next two were more successful and in due time the original was able to retire with his Lady and try to grow roses. But—it had to happen—the day comes when Widowmaker 3, Jason Newman (he gave himself a new name and a new face when he decided to get out of the family business) stands in Widowmaker 4's way and gets shot. Sidekick Ito Kinoshita shakes his head and heads back to Widowmaker 1 to say, "Kemosabe, you didn't finish training 4."

So the original Widowmaker, or Jefferson Nighthawk, puts down his bag of rose food and ventures forth one more time. He's lost none of his skills, and once he takes down a couple of supposedly unkillable villains, his clone shows up for lessons. But then Jason Newman gets a call for help from an old friend. Mere days after his newly cloned organs have been installed, he checks himself out of the hospital and saddles up. The other two promptly call him several kinds of idiot and start trying to track him down so they can help. And as it happens, the trouble the old friend needed help with is so serious that it takes all three to save the galaxy.

Resnick is in typical form here, smooth and fast-paced and very readable, with a bit to say on the need even of gonzo bounty hunters for wisdom and restraint. There are shades of gray even in the black and white world of shoot-'em-up space opera.

Mike tells me that his coming attractions include *Starship: Mutiny*, the first in a five-book series from Pyr (Prometheus). Watch for it!

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Mike Resnick shows a very different aspect of his talent in **Lady with an Alien**, part of Watson-Guptill's "Art Encounters" series of young-adult fictions about great artists. Here the artist is Leonardo da Vinci, who did a painting called "Lady with an Ermine" long before he did the "Mona Lisa." Alas, says Mike, the ermine doesn't look much like an ermine. The reason why is that a time-traveling boy, Mario Ravelli, lost his blue-pelted alien pet, Melody. Leonardo, feeling frustrated at having to paint his patron's mistress with a wiggly cat in her arms, found it in his quarters and was quite enchanted. And then Mario showed up, wanting it back. The two get along pretty well, considering their times are more than a thousand years out of synch, and Mario (not to mention the reader) gets a guided tour of Renaissance Milan and of Leonardo himself.

It's a charming tale that amply fulfills its function within the series. Pairing Leonardo with an SF writer is a great idea; other artists lend themselves to the same approach, and I'm looking forward to Resnick's coming "Art Encounter" with Salvador Dali. He's also got one coming with Toulouse-Lautrec; the combination seems less natural, but knowing Mike, it will turn out well.

One of the classic plots in SF is the flight from an Earth made intolerable by political tyranny or environmental or technological catastrophe. Like the even more classic Adam-&-Eve plot (last man, last woman, guess who?), it's been done so often that when one runs into it, one is immediately skeptical. Yet in the right hands, even the ripest of clichés can be made fresh. In **Building Harlequin's Moon**, Larry Niven and Brenda Cooper manage this by using the flight from Earth as back-story. The reader never sees it. The runaway growth of nanotechnology and artificial intelligence is mentioned as the reason why the *John Glenn* and its sister ships fled to set up a new and purely human realm on the world of Ymir. The story is what happened when things went wrong. The *John Glenn* never made it to Ymir. Crippled by systems failure, it limped into an entirely different system and faced the need to terraform a moon of the gas giant Harlequin, plant a human colony, and grow it up enough to build the infrastructure to refill the *John Glenn*'s antimatter fuel tank.

Fortunately, they have cold sleep, with a nanotech boost that can physically rejuvenate sleepers. After some 60,000 years, it is time to plant the human colony and get down to business. Unfortunately, the colony has deep class divisions. The top of the heap is the Council of Humanity, the leaders of the escape effort. Next down are the Earth-Born. Then come the Moon-Born, who are viewed as labor, disposable, to be left behind to die when their work is done. And finally, the single AI, Astronaut, who is tightly constrained to prevent Earth-style problems.

It doesn't take long for a few Moon-Born, such as Rachel, to develop a sense of how badly they're going to be screwed. She displays great intelligence when being trained to plant and monitor the vegetation that will help make the moon livable. Her mentor, Council member Gabriel, even takes her up to the ship, where she runs into the viciously mission-oriented Ma Liren as well as the more thoughtful Treesa. When she is maneuvered into a twenty-year cold-sleep absence from home that costs her both a lover and friends, she is alienated. But she also remains dedicated to cooperation, even as others are taking more confrontational approaches to the basic issue. Fortunately, Rachel is a rather charismatic figure; she inspires loyalty, and it is in large part due to her efforts that the tale comes to a benign conclusion. Helpful turnabouts among Council members feel rather forced by the authors, but that is not enough to spoil the sense of Rachel as a remarkable

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woman, nor of the story as a very satisfying read.

Of course, Niven has been delivering satisfying reads, both alone and with various collaborators, for many years.

Enjoy!

As a biologist, I am always happy to see signs that genes make a difference. Carl Sagan was surely a creative genius, and here we have his son Nick being just as creative. He's a successful screenwriter, and he has turned his hand to SF with the successful *Idlewild*, and now the sequel, **Edenborn**. The basic idea is one that feels very real when the news carries reports of Ebola and avian flu and other potentially disastrous plagues. Here the plague is Black Ep, quite incurable and inevitably fatal. Humanity is doomed. Some have themselves frozen in hope of later resurrection. However, there is a frantic effort to find a warmer answer, and the Gedaechtnis company manages to do a bit of gengineering that just may create a generation with immunity. Since there won't be anyone to raise the kids, the tech wizards must also program a virtual reality that can do the job—kids in vats while their bodies grow, their minds tended by virtual families and virtual schools in virtual suburbs. At age eighteen, dump 'em out and introduce them to cruel reality. Cruel indeed, massive disillusionment, the usual transition writ very large indeed. It's no wonder the kids turn out to be about as wiggy as they come.

Halloween, disillusioned by having had to kill his one-time best friend, now lives all alone in Idlewild, Michigan. Isaac lives in Egypt, restoring pyramids and raising a non-gengineered flock of kids, mostly boys (heavily medicated to keep Black Ep at bay), to be good Sufis. Pandora, Champagne, and Vashti live in Mad Ludwig's fairy-tale castle, Nymphenburg, in Bavaria, raising gengineered girls. As *Edenborn* opens, it is time for an exchange of kids, and we are introduced to the central characters: Penny, 15, sly, manipulative, selfish, scheming, as true a bitch as you could hope to meet. Haji, physically crippled but mentally very able, even noble, a nice foil for the bitch. Both reflect their parents.

And then there's Deuce, introduced early on but not in a way that tells us much about identity, only that he has Prometheus fantasies. In due time, Sagan reveals all, on the way to playing the fatal attraction card that nearly destroys the last traces of humanity (don't forget—there's a sequel, so folks must survive) and nearly aborts the desperate search for a cure for Black Ep and its even nastier successor. I say "nearly" because it's no secret that the tale goes on; the back of the book includes an excerpt from the sequel, *Everfree*, due soon from Putnam.

The characters are well drawn. This is a tale that easily absorbs the reader without raising many questions about the credibility of the premises. Yes, there are nasty diseases lurking in the world, and fears of a Black Ep (natural or designed) are not at all unjustified. Genetic engineering and cloning are under development today, and virtual reality has been a science fiction staple for years. Yet there are problems. Even if one grants the success of a last-ditch gengineering effort, the equally last-ditch development of a virtual reality capable of autonomously and successfully raising a batch of kids to adulthood raises *my* doubts. It has become a truism that major software projects have difficulties both in the development stage and after. They miss deadlines, and they wind up full of bugs. Sagan supposes a supervisory AI named Malachi, but that doesn't strike me as enough to guarantee success.

You say I should stop with the quibbling already? If you didn't get the hardcover in 2004, go get the trade paperback now. You'll enjoy it.

Ken MacLeod outdoes himself with

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Learning the World. Not that he wasn't already good (see *Newton's Wake*, reviewed here in November 2004), but this is a new step toward the heights. He has not forgotten the Spike or Singularity, but here he steps more than ten millennia into the future. Humanity has expanded outward from Earth, first surrounding Sol with so many greenery-filled habitats that its light, from a distance, seems green. Then it spread to nearby stars and did the same around them. Over the millennia, the number of green stars has grown. Humanity thrives as never before, and if occasionally a Spike happens and a local portion of humanity is devoured by runaway artificial intelligences and the like, the Civil Worlds go on undisturbed.

The tale opens with the words of biologger (blogger) Atomic Discourse Gale, who reports her discovery that her ship, *But the Sky, My Lady! The Sky!* is four thousand years old, and her meeting with Constantine the Oldest Man. The ship has been on its way to a new star for centuries, and now it is almost there. Unfortunately, the probes report that it is occupied. Did someone beat them to their destination? Or has humanity finally met its first aliens?

The reader is in no doubt, for MacLeod alternates scenes between the ship and the world, which indeed has its own people, batlike and intelligent, at a technological level roughly the equivalent of early twentieth century Earth. An astronomer, Darvin, spots the ship's drive flare in the sky and thinks he has found a new comet until he sees it is slowing down. It is not long before he and his friends perceive the truth, nor before the local security apparat claps the lid on.

Aboard the ship, Atomic and her friends want to get on with their destiny, colonizing the system, but they face an unprecedented question: Do they have a right to do so when the system has natives? MacLeod plays out the debate in very convincing fashion, but he is even more convincing in his portrayal of the natives, who are intelligent enough to see what is happening, detect the surveillance mechanisms hidden in local wildlife, and accelerate the development of their technology in directions that are suddenly obvious. They are also sane enough to back away from an incipient war and pull together in the face of the potential threat. In some ways I found Darvin and his friends more alive than the human characters! Certainly, at the end I wished he had given more attention to their aftermath instead of only that of the humans.

But there is room for a sequel or two. With luck, he will deliver them and we will learn more of Darvin's people. Meanwhile, don't miss this one.

Adam Stemple is a working musician and has collaborated with his mother, Jane Yolen, on several books for youngsters (including *Pay the Piper*, reviewed here last October). In the writing world, is he known as just "Jane Yolen's son"? If so, that may be about to turn around, to the point where Jane is known as Adam Stemple's mom!

Yes, his first solo novel, **Singer of Souls**, is that good. The protagonist, Douglas, starts off as a Minneapolis guitarist and junkie who realizes that if he really wants to get the monkey off his back he has to chuck it all, go somewhere else, and start over. Fortunately, he remembers, he has a grandmother in Edinburgh who once issued a standing invitation. And he can just about swing the plane ticket. Grandma turns out to be a no-nonsense sort who is cool enough to be delighted when Doogie says he's going to make his nut on the streets. Why, he's a busker! And with the Fringe coming up, he has it made.

Except . . . A strange lady asks him to "sing" her and then rewards him with a vial of white powder he cannot resist, though the powder is not what he expects when he shoots it up. It doesn't make him high. Instead, he can sudden-

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ly see the fey folk who have their own festival in the streets of Edinburgh. And who don't like seeing him notice them. Now he's running for his life, discovering evil, and learning that he himself has strange powers. If he can master them quickly enough, he may survive. But that's a big if. He's about to be beaten and stabbed and sliced. He will lose what is dearest of all to him. A priest who is a serial killer of elves and goblins will try for him. Elven armies will be after his ass.

It's a story. We can predict that he will prevail. But I called him a protagonist instead of a hero on purpose, for the ending is quite unheroically bleak.

You're gonna love it.

Jane Yolen was one of the Guests of Honor at the World SF Convention held last August in Glasgow, Scotland. She is a prolific and gifted woman in whose works one must assiduously search for flaws (with most writers you don't have to search). She is also charming. It is therefore a pleasure to tell you that NESFA Press continues its habit of honoring Worldcon GOH's with celebratory books with **Once Upon a Time (She Said)**, a collection of some fifty short stories, thirty poems, and a few articles, including "Oh God, Here Come the Elves," in which she discourses upon the joys of surrendering to elves (get *that* out of your mind; dominance-submission fantasies are on the second floor, back right corner).

This one is a pleasure to read and keep. Don't deny yourself. ■

IN TIMES TO COME

In recent issues we've featured several stories set in John Barnes's "Springer" universe, in which our everyday spatial constraints are unlamented parts of the dim past. Our lead novella for March is in a sense the climax of the series, revealing parts of that history heretofore only hinted at—at both the grand and the intensely personal scales. And I mean "intense" quite literally—whether or not you've read other stories in the series.

Joel Davis, who has done a number of science fact articles for us in the past, returns with "Worlds Enough," an up-to-the-moment survey of the farthest reaches of the Solar System, which are considerably more distant and a lot less empty than we used to think. In addition, we'll have stories by Larry Niven, Grey Rollins, Carl Frederick, and Henry Melton—and, of course, the dramatic conclusion of Karl Schroeder's serial *Sun of Suns*.

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BRASS TACKS

Dear Dr. Schmidt,

In regards to your editorial, "Cowardice in the Classroom," I must say that I agree with most of what you said. I do agree that creationism and intelligent design being taught side-by-side with evolution as though they too were sciences is wrong, and unconstitutional. Evolution is a scientific concept that has withstood the rigors of peer review and public scrutiny. Intelligent design and creationism are philosophical and theological concepts respectively. There is no science to speak of in either concept. Evolution and creationism should not be talked about in the same breath in a science class.

What I disagree with is your handling of the argument of intelligent design. The "level of vague hand-waving" that you refer to has been subject to almost as much scrutiny as the concept of evolution. Before evolution was even in its infancy, the concept of an Intelligent Designer crafting the universe had been around for quite some time, on the order of thousands of years before Darwin set foot on the Galapagos Islands, and had been the subject of criticism since its inception. As far back as Plato, who might have been one of the first recorded atheists, through David Hume, a British philosopher whose writings ostensibly supported Christianity, but really made it the subject of mockery, to today, the argument for intelligent design has withstood much criticism, and has undergone much transformation for the thousands of years it has been around. That "hand waving" has been the careful consideration of those who have literally given up their lives and intellects to see if intelligent design is a viable argument in the philosophical realm.

Now I don't want to appear as though I am advocating the teaching of intelligent design. Where I think you and many others who support evolution go wrong is in the use of the principles of evolution, mainly that things occur only because of natural processes and that life and the universe are here because of some random process, to try and prove that God, or an Intelligent Designer, does not exist. Most of what I hear in the debate between the two sides is that of fear. The two sides act as if the two concepts are incompatible, that acceptance of one will make the other shrivel up and die. You can't blame fundamentalists for wanting to preserve their beliefs any more than they can blame scientists for wanting their theories to be accepted. The only reason the "True Fundamentalists" have had to dig "into a logically insupportable position" is that somewhere in the debate, there was a miscommunication, and an inability to change one's beliefs or to adjust. Both parties are guilty.

There are not two camps in this debate, the right and the wrong, the evolutionists and the fundamentalists, but rather there is a considerable segment of the population who can see the truth of both sides. Evolution does not cancel out intelligent design anymore than intelligent design cancels out evolution.

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The two concepts talk about different things. And why can't there be compromise, or a synthesis of the two beliefs? I have no trouble believing that evolution might be a tool of some kind of Intelligent Designer, instead of a justification for believing that It does not exist. What better way to show how intelligent that Designer is than to suggest that maybe evolution is part of the design? After all, what's crazier to believe, that the universe was created by a higher power or that it simply popped into existence with all these pre-determined natural laws?

I think that both parties need to come out of the foxholes and talk about this issue on the same plane before the trenches are dug too deep.

David Prina
Yorba Linda, CA

No, I did not *"try to prove that God, or an intelligent designer, does not exist." Rather, I said that the principles of science, at least as it's now understood, can* neither *prove nor disprove that, so a science class is an inappropriate place for discussion of it—which is an entirely different thing. I explicitly acknowledged the possibility of an intelligent designer as an "instigator" of evolution, though I also cautioned that even if there is one, the fact would raise questions at least as large as the ones it purports to answer. For that reason I admitted my* personal skepticism *about it, which is not even remotely the same as a claim to disprove. My central point was that science is about what can be logically deduced from empirical evidence, using "logical" in a rigorous sense, and that questions that we can't answer that way do not belong in science classes. You're right that some form of "intelligent design" has been discussed for a very long time, but amount of talk is not a valid measure of strength of evidence of logical solidity.*

Dear Mr. Schmidt:

Your editorial, "Cowardice In The Classroom" (October 2005), was as excellent a piece of religious monologue as I have seen in some time. After all, atheism (and its child, "secular humanism") is a religion based on the "theological" premise, "There is no 'God'," from which all of its political, social, and pedantic statements logically follow.

Evolutionary theory is as fleshless as the rock embedded bones of dinosaurs—the meaning of which is still very unclear (e.g. "Feathers or scales?") and open to what can only be described as "mystical interpretation." Although "molecular biology" is well beyond my expertise, I suspect that there has been and is as much "casting out" of "unbelievers" in that area of science as in any other ideology based on the enforcement of some current orthodoxy. Evolution is taught, especially in universities and now in *Analog*, as a matter-of-faith subject to the same use of force and condemnation as any other inquisition.

I suspect that I have been reading *Analog* (and its predecessor) for longer than you have been alive. I have used it to stretch my mind. I do not need any *mullah*-like *fatwa* from your desk to limit my thinking to what is (only) currently orthodox in the world of science.

If you have not erased this communication before this point, I congratulate you on the retention of some attention to real scientific inquiry and refer you to the article given below and to the attachment to this note.

I suggest that you limit your preaching to some other forum and leave *Analog* open to truly free thought and expression. It was, after all, once the magazine that challenged orthodoxy.

James Pawlak
West Allis, WI

Strong words, weak logic. Atheism and secular humanism have nothing

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to do with my argument, and I did not start from the premise that "There is no God." I merely said that science can't answer the question one way or the other (or as a bumper sticker I recently saw said, "I don't know and neither do you."), so science classes should restrict themselves to what science can *answer with a reasonable level of confidence. Nor did I try to limit your (or anyone else's) thinking to what is currently orthodox in science, though I do favor certain narrow limits on* where *you teach very contrary ideas as fact. To claim that the current level of general scientific acceptance of evolution is "just a religion" is just a word game with no substance. Evolutionary biologists know there's plenty of work still to be done in understanding the details, but they have a* lot *of evidence to support their claims, which they've laid out in full public view. "Creation scientists" have not.*

Dr. Schmidt,

I am finally writing a letter to *Analog* after being a faithful reader for more than 45 years. *Analog* has provided many years of entertainment and enjoyment for me and I am appreciative of that. Thank you. However, I need to take you to task for your October 2005 editorial. A lot has changed over time, and not always for the best.

• God: "Man shall not live by bread alone; but man lives by every word that proceeds from the mouth of the Lord." (From Deutonomy 8.3)

• Schmidt: "The essence of science is that evidence, logic, and more evidence are the keys to understanding the world."

• Steve: "I've lived long enough and now know enough to now choose God over Schmidt."

I've changed from being an atheist to being a follower of Christ. It has been interesting for me to grow in understanding from a child of 12 to a man of 58 in that I've learned a thing or two. One of the things I've learned is that the current thrust of tolerance is zero tolerance for Christian thought, practice, and belief in this country. Liberals have fostered the practice of helping those sad souls who cannot live with opposite beliefs by insisting that all contrary thought be prohibited. We've seen this with the political correctness movement in the Western World; and with the diversity thrust that all beliefs are correct, or should I say worthless. All thought is driven to the lowest common denominator.

You complain that fundamentalists (Christians, I think) are protesting evolution. I contend that this is a pitiful misdirection to a straw man that has little meaning in the overall scheme of things. It has little meaning in relation to the Liberals work in the past 30 years to ban and make taboo any public expression of Christian values. We all know how state funded public primary and college schools prohibit Christmas, Easter, and the study of the Bible. Tolerance is now defined as the exclusion of controversial ideas like Christianity, rather than the free expression and debate over different ideas.

You bring up one small part of the overall picture, evolution, and ignore the whole exclusion of Christian expression as if the past 30 years have been beneficial to the US. In fact, the earlier 200 years had a more diverse and interesting interplay of different thoughts. People used to be more educated and intelligent—the New York State regents passing grade is now 50%. What a shame and a disgrace!

So with this new understanding that I have of *Analog* I looked at the characters in the stories in the October issue. They were mostly listless and vulgar, with little motivation and purposeful direction. There were many that were living dissolute lives with unmarried partners, or with little sense of community. The Lord's name was often taken in vain, with no literally value. I say, are

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these characters too juvenile? Is *Analog* fun any more? No.

Stephen J. De Marco
Binghamton, NY

You apparently missed my point and try to distort it into a misrepresentation of yours. The overall role of Christianity in our culture, and for that matter Christianity as such, was not at all the subject of what I wrote. My subject was quite specifically the suppression, for whatever reason, of the teaching of an important part of science in what are presented as science classes—nothing more than that, and nothing less.

Greetings!

I have been an *Analog* reader for many years. I started sometime in the early '60s and continued until I took a break in the '90s. Once I found the e-book subscription at www.fictionwise.com, I once again returned to the fold about a year ago.

I have never written in to the magazine before, but your well written editorial in October 2005 has finally gotten me to pick up my pen, albeit an electronic one.

Being raised in the '50s and '60s I was early on indoctrinated about evolution being fact and anyone not believing in it must be some kind of retarded, unscientific idiot. Being a science orientated young fellow (computer programmer currently), I did not want to be labeled like that and so I swallowed the whole thing as truth, hook, line and sinker!

In the mid '90s I started to study the basis behind the theory and finally reached the conclusion it just was not sound. Recently in an issue of *Analog* (this spring I think) in the book review section, I came upon a reference to a book called *Kicking The Sacred Cow* by James P. Hogan. It was a short, but positive review, and it piqued my curiosity. I am sure you can find the reference quicker than I.

I purchased an electronic copy and read it. I was so impressed with some of the interesting things he brought up that I then proceeded to buy about half a dozen hardback copies to lend and give to friends and family. They all find the book fascinating and I still keep copies circulating. I do not agree with all he presents, but do find the topics and ideas he presents stimulating. I never want to think I know everything about subjects previously learned. So I continue to read and investigate from all aspects of a topic.

The reason I am mentioning this is I would recommend you read his chapters on evolution. It is fairly succinct and gives a great overview on the state of evolution today.

By his reasoning (and many other scientist I might add), it is far from being a done deal as your editorial implied. Nor is there overriding evidence that the theory is indeed proven. In fact, there is getting to be a large body of evidence that it is not only not proven, but is in fact down right indefensible!

I have no problem with the theory of evolution being taught in schools. But they should balance it with equal time on all the known problems with the theory and how it is so flawed. Then let students make up their own minds.

One reason I suspect this is such a hot topic is that those who believe in evolution as fact, simply have to. If they didn't, they would then have to see what other theories might fit the facts better and that is what scares them. That's my opinion of course, and could be way off base.

I still thoroughly enjoy *Analog* and hope to be reading it long into this century! Keep up the great work.

M. Scott Adams

"Details still to be worked out" is a long way from "the whole thing is indefensible." Certainly teaching about evolution should indicate best guesses about degree of confidence of various

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assertions, and to the extent that available time and the students' level of sophistication permits, areas that still have open questions. "Equal time" is probably too much (except in grad school, where open questions should probably be the main *emphasis), and I certainly couldn't endorse giving equal time to theories (such as "young-Earth creation science") that can't even make it to the starting gate in scientific terms. You're certainly right that the topic is loaded with "hot buttons" on both sides, but I have yet to see these theories that "fit the facts better"—and I have looked.*

Dear Mr. Schmidt,

I've been an avid science fiction fan for 40 years and *Astounding* and *Analog* have been my favorites, especially the editorials (I've just ordered your book of collected essays, *Which Way To The Future?*). Since I received my Elementary School teaching certification 30 years ago, I was particularly interested in your October editorial, "Cowardice in the Classroom." Having been a teacher myself, I know first hand that many teachers will spend hundreds or even thousands of dollars of their own money to help their students because school budgets don't allow them to get the things they know their students need. So, I was baffled by your editorial.

You are proud to stand up for what you believe (evolution), and utilize the method available to you (your editorial, read by thousands of people) to promote it.

Yet you refer to teachers who stand up for what they believe (creation/intelligent design) and utilize the means available to them as cowards.

Personally, I think "cowards" is the wrong word. Rather, I think they have *integrity*.

Meanwhile, I will stand up for your right to your own opinions and the freedom to express them. However, I think you may have went too far with your statement, "... the creationists may outnumber the scientists—but they're still wrong." Saying this, you imply that all scientists are not creationists, and that evolution is the only correct view—and perhaps you really do believe that. However, this is not correct by any means. A quick way to illustrate this is by flipping through the book, *In Six Days: Why Fifty Scientists Choose To Believe In Creation*. The essays in this book were written by scientists in a wide range of fields, including mechanical engineering, biology, biochemistry, medical research, physical chemistry, physics, mathematical physics, genetics, organic chemistry, horticulture science, inorganic chemistry, mathematics, botany, theoretical chemistry, medical physics, and geophysics. These scientists believe that the theory of evolution is flawed with many holes in it and should be rejected. I also am fortunate to have two relatives who are senior scientists and I gave them a copy of the book. They read the essays that were written by scientists in their own fields and told me that the essays were indeed accurate. So perhaps the discussion is really between scientists and other scientists now.

I hope you are interested in pursuing this matter further and seek out this book. And your readers might also be interested in the book, *What's Darwin Got To Do With It?*, which is a very easy reading book of only 144 pages. Or you might refer them to the website www.reasons.org, which has many scientists and scientific scholars contributing to the view that creationism is indeed true, including Ph.D.s from Iowa State University, Texas A&M, Cal State, Jet Propulsion Laboratories, University of Florida, Baylor University, Ohio State University, University of Oklahoma, University of California, Purdue University, Yerkes Observatory, and UCLA.

Thank you for taking the time to read this. And fear not—you are not losing a subscriber due to your editorial. In-

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stead, you gained one! I was buying *Analog* at my local bookstore, but I am mailing in my subscription card today.

Len Lindsay
Madison, WI

I did not call the teachers who teach creationism or intelligent design because they personally believe it cowards; maybe I should have more explicitly acknowledged that they are a rather different case from most of the others I talked about in that editorial. However, this does not mean that I think they should be encouraged or even allowed to do what they're doing. Science is a fairly well defined methodology, which in this area has developed a fairly strong consensus about what conclusions can most reasonably be drawn from the data we've collected so far. (The "many scientists" you mention are still a small minority, and you can find individual scientists who believe just about anything, especially outside their own specialties. They're human, too.) Classes intended to teach about that methodology and those conclusions should do so; allowing people to go into those classes and teach whatever they want, whether or not it holds up under that kind of examination, makes a travesty of the whole concept.

Dear Dr. Schmidt,

Regarding your October editorial, I share your view of "creation science" (and who was it who said that any discipline which has "science" in its name probably isn't?). But what if the creation science lobby is taken seriously on its own terms? Equal time for evolution and creation science, with the merits of the two theories being compared in detail? That might add to the interest in science. (Though it might be difficult for creation science to match the time required just for the fields you list—evolution, morphology, paleontology, biogeography, embryology, population genetics, molecular biology, and genomics—let alone other relevant fields like astronomy.) And, of course, it would be essential to emphasize repeatedly that "It's only a theory"—for both options—equal treatment, after all. Is anyone prepared to try it?

Michael Harman
Camberley, Surrey, UK

An interesting suggestion, but it would give too much time to something that doesn't deserve it at the expense of something that does. It probably is a good idea to spend some *time on "creation science," though, to show why most scientists don't think it deserves more.*

Stan,

In your October editorial, you wondered if Tennessee students were taught evolution between the Scopes trial and 1967 when the law was repealed. I finished high school in a small town in Tennessee in 1968. I was taught evolution in biology and both the high school and county library had a copy of de Camp's book on the Scopes trial.

I asked a teacher about the teaching of evolution and she said that she, the schools, and the Tennessee Department of Education—which is responsible for approving curriculum and books for all schools below the college level—just simply ignored the law all those years. She should know, for she had been teaching since 1930.

Interestingly enough, Tennessee requires one year of Tennessee history. The book that I used in the 7th grade had a section on the Scopes trial.

Radcliffe Cutshaw
Knoxville, TN ■

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2005 Index

Here is the Index to 2005, *Analog*'s Volume 125. Entries are arranged alphabetically by author, with month and page. When the author's name and/or part of the entry's title is omitted, it is the same as that of the previous entry. Multiple entries by the same author are listed alphabetically according to the story/article title. Collaborations are listed under all authors with cross references. Unless otherwise noted, each entry is identified as an Alternate View (av), editorial (ed), fact article (fa), guest editorial (ge), novella (na), novelette (nt), poem (pm), Probability Zero (pz), serial (ser), special feature (sf), or short story (ss).

Anderson, Kevin J.
Paradox & Greenblatt, Attorneys at Law (ss) ..... Sept 76
Rough Draft (ss) ..... Jan/Feb 80
(with Rebecca Moesta)

Barnes, John—
The Diversification of its Fancy (na) Nov 98
Bartell, David—
Alphabet Angels (ss) ..... Mar 42
(with Ekaterina Sedia)
Smiling Vermin (ss) ..... May 96
(with Ekaterina Sedia)
Baxter, Stephen—
Climbing the Blue (ss) ..... Jul/Aug 150
The Time Pit (ss) ..... Oct 88
Bechtel, Amy—
Language Lessons (nt) ..... Oct 8
Benford, Gregory—
The Pain Gun (ss) ..... Jul/Aug 140
Bova, Ben—
The Supersonic Zeppelin (nt) ..... Jan/Feb 102
Brin, David—
Mars Opposition (nt) ..... Jan/Feb 120
Burkhead, David L.—
Her World Exploded (ss) ..... Apr 42
Burns, Stephen L.—
Smiling Faces in Hog Heaven (ss) .Oct 79
Burstein, Michael A.—
Sanctuary (na) ..... Sept 8
Seventy-Five Years (ss) ..... Jan/Feb 74
Telepresence (nt) ..... Jul/Aug 160

Carter, Scott William—
A Christmas in Amber (ss) ..... Dec 54
The Time Traveler's Wife (ss) ..... Jul/Aug 126
Chase, Robert R.—
Endeavor (nt) ..... Jul/Aug 88
Cramer, John G.—
The Ball Lightning Puzzle (av) ..... Dec 76
The Big Rip at the End of Time (av) ..... Mar 70
Dark-Energy Stars vs. Black Holes (av) ..... Oct 66
"Outlawing" Wormholes and Warp Drives (av) ..... May 72
Solving the RIHC Puzzle (av) ..... Jul/Aug 122
Creek, Dave—
Infinity's Friend (ss) ..... Oct 72

Donaldson, Thomas—
Where Are They? (fa) ..... Jan/Feb 62
Dulski, Thumas R.—
The Case of the Contumacious Qubit (nt) ..... Nov 66

Easton, Tom—
The Reference Library ..... Jan/Feb 230
——— ..... Mar 133
——— ..... Apr 132
——— ..... May 134
——— ..... Jun 132
——— ..... Jul/Aug 230
——— ..... Sept 132
——— ..... Oct 134
——— ..... Nov 133
——— ..... Dec 134

Foss, Richard—
Keeping Track (pz) ..... Nov 95
Frederick, Carl—
General Tso's Chicken (ss) ..... Mar 74
Hotel Security (ss) ..... Dec 64
This Little World (ss) ..... Jun 78
Much Ado About Newton (pz) ..... May 76
Prayer for a Dead Paramecium (ss) Jul/Aug 130
The Speed of Understanding (ss) ..Sept 54

Gillett, Stephen L.—
Analog Computing (fa) ..... Apr 70
Retirement Homes of the Gods (fa) ..... Nov 50
Glass, James C.—
Dark Peril (ss) ..... Mar 56
Reinventing Carl Hobbs (ss) ..... Apr 54
Gunn, James—
Uncreated Night and Strange Shadows (na) ..... Jan/Feb 154

Hemry, John G.—
Standards of Success (ss) ..... Apr 63
Working on Borrowed Time (nt) .. Jun 46
Howe, Robert J.—
Do Neanderthals Know? (nt) ..... Dec 84
Entropy's Girlfriend (nt) ..... Oct 112

Kelley, Laura M.—
Big Brother Inc.: Surveillance, Security, and the US Citizen (fa) .May 30

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Kirkland, Kyle—
Company Secrets (nt) ..... Apr 8
Klein, Jay Kay—
The *Analog/Astounding* Photo Yearbook (sf) ..... Jan/Feb 90
Biolog: Carl Frederick (sf) ..... Mar 89
Kooistra, Jeffrey D.—
Allure-Free Strings (av) ..... Sept 67
Nova Terra (ss) ..... Jan/Feb 144
Orion (av) ..... Nov 92
Kelvin (av) ..... Jun 92
Review of *Kicking the Sacred Cow* (av) .... Apr 66
75 Years of Alternate Views (av) .. Jan/Feb 140

Lewis, Anthony—
Upcoming Events ..... Jan/Feb 240
——— ..... Mar 144
——— ..... Apr 144
——— ..... May 144
——— ..... Jun 144
——— ..... Jul/Aug 240
——— ..... Sept 144
——— ..... Oct 144
——— ..... Nov 144
——— ..... Dec 144
Lovett, Richard A.—
911-Backup (ss) ..... Nov 66
A Few Good Men (na) ..... Jan/Feb 186
Gene Doping and Other Olympic Scandals of the (Not-So-Distant) Future (fa) .... Jun 34
Netpuppets (nt) ..... Jun 106
(with Mark Niemann-Ross)
The Prehistory of Global Climate Change (fa) ..... Mar 30
Tomorrow's Strawberries (ss) ..... May 84
The Wired Ocean: Doing Oceanography Without Getting All Wet (fa) .... Oct 26
Zero Tolerance (nt) ..... Oct 98

Manly, Peter L.—
July Fourth, 2213 (pz) ..... Jul/Aug 118
McCarthy, Wil—
Mission to Utah: A Science Fiction Writer's Adventures at the Mars Society Desert Research Station (fa) ..... Jul/Aug 40
The Policeman's Daughter (na) .... Jun 8
Mitchell, E. Mark—
Improbable Times (ss) ..... Jun 66
Moesta, Rebecca—
Rough Draft (ss) ..... Jan/Feb 80
(with Kevin J. Anderson)

Niemann-Ross, Mark—
Netpuppets (nt) ..... Jun 106
(with Richard A. Lovett)
Niven, Larry—
Breeding Maze (ss) ..... Sept 46
The Slow Ones (ss) ..... Dec 80

Oltion, Jerry—
The Best-Laid Plans (ss) ..... Sept 71
Tainted (ss) ..... May 78

Plante, Brian—
In the Loop (nt) ..... Jul/Aug 66

Letters of Transit (ss) ..... Apr 80

River, Uncle—
How Bears Survived the Change (ss) ..... Jun 96
Rollins, Grey—
Death as a Way of Life (nt) ..... May 39
Give Up The Ghost (nt) ..... Sept 98
Rosenblum, Mary—
Search Engine (nt) ..... Sept 85

Schembrie, Joe—
High Moon (nt) ..... May 110
The Keeper's Riddle (ss) ..... Jul/Aug 108
TheWrong Side of the Planet (nt) .. Oct 50
Scherrer, Robert—
Copernican Principle (pz) ..... Mar 68
Schmidt, Stanley—
Alibis, Safety, and Freedom (ed) .. May 4
Cowardice in the Classroom (ed) .. Oct 4
A Diamond Milestone (ed) ..... Jan/Feb 4
Diffuse Tyranny (ed) ..... Nov 4
Inevitable Clichés (ed) ..... Jul/Aug 4
A Noisy Signal (ed) ..... Mar 4
No Politics, Please (ed) ..... Dec 4
Softening Us Up (ed) ..... Sept 4
Whence Comes Morality? (ed) .... Apr 4
Zero-Pollution Solutions (ed) ..... Jun 4
Schoen, Lawrence M.—
Take Me To Your Liederkranz (ss) .Sept 43
Schroeder, Karl—
Sun of Suns pt I (ser) ..... Nov 8
Sun of Suns pt II (ser) ..... Dec 100
Sedia, Ekaterina—
Alphabet Angels (ss) ..... Mar 42
(with David Bartell)
Smiling Vermin (ss) ..... May 96
(with David Bartell)
Shaffer, Catherine—
The Doctrine of Noncontact (ss) .. Oct 36
Sparhawk, Bud—
Chandra's Pup (na) ..... Jul/Aug 190
Stone, Eric James—
Resonance (nt) ..... Sept 112

Tourtellotte, Shane—
Acts of Conscience (nt) ..... Mar 8
Footsteps (nt) ..... May 8
Turtledove, Harry—
Audubon in Atlantis (na) ..... Dec 8
The Genetics Lecture (pz) ..... Oct 70

Vajra, Rajnar—
Of Kings, Queens, and Angels (nt) .Jul/Aug 10
Van Cleave, Fran—
Testosterone Replacement: Beyond Viagra to Successful Aging (fa) ..... Dec 43
Van Pelt, James—
The Inn at Mount Either (ss) ..... May 58

Walsh, Kevin—
Water World, Glacier World, Dust World (fa) ..... Sept 36
Williamson, Jack—
The Stonehenge Gate pt I (ser) .... Jan/Feb 12
The Stonehenge Gate pt II (ser) ... Mar 90
The Stonehenge Gate pt III (ser) .. Apr 90

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IT'S ANLAB TIME AGAIN

YOUR BALLOT WILL BE AUTOMATICALLY ENTERED IN OUR DRAWING FOR A FREE ONE-YEAR SUBSCRIPTION!

Welcome to the year 2006! As usual, we're asking you to choose your favorites via the Analytical Laboratory. Not only will your votes provide tangible awards for authors and artists, but your feedback will help guide the selections we offer you in the future. Your vote is important!

Look over all your copies of *Analog* dated 2005, or refer to the index on the following pages. Pick your *three* favorites in each of the following categories: novella, novelette, short story, science fact article, and cover. If you're not sure about a piece's category, you'll find it listed both in the Table of Contents for the issue in which it appeared, and in the Index. In the event of a disagreement between the Table of Contents and the Index, the Index should be considered correct. List your choices in order of preference (your favorite in each category is #1) on the ballot below, and either mail it in or send it by e-mail. You can also vote at our website, **www.analogsf.com**. The ballot is intended to make it easier for you to vote, but if you don't want to cut it out, feel free to copy it.

To be sure your vote counts, please have it reach us by **January 31, 2006**.

Please, only vote once! Thank you very much!

Votes via snail mail: AnLab, *Analog*, 475 Park Avenue South, Fl 11, New York, NY 10016-6901.

Votes via the Internet: www.analogsf.com or analog@dellmagazines.com

NOVELLAS

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NOVELETTES

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3. _____

SHORT STORIES

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2. _____
3. _____

SCIENCE FACT

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2. _____
3. _____

COVER

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2. _____
3. _____

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UPCOMING EVENTS Anthony Lewis

13–15 January 2006
ARISIA (New England Speculative Media conference) at Boston Park Plaza Hotel, Boston, MA. Guest of Honor: Allen Steele; Artist Guest of Honor: John Howe; Fan Guest of Honor: Barb Schofield. Registration: $40 at the door ($20 Friday, $35 Saturday, $20 Sunday). Info: www.arisia.org; info@arisia.org; Arisia, Building 600, PMB 322, 1 Kendall, Cambridge, MA 02139.

20–22 January 2006
COSINE (Colorado-area SF conference) at Colorado Springs, Colorado. Guests of Honor: Sharon Lee & Steve Miller. Info: http://www.stardel.com/cosine/index.html; COSine, Box 50618, Colorado Springs, CO 80949-0618. [Note: may be held 13-15 January—check the website]

27–29 January 2006
VERICON VI (Harvard multi-media conference) at Harvard Yard, Cambridge, MA. Guest of Honor: George R. R. Martin. Info: www.vericon.org; conchair@vericon.org; Vericon VI, c/o 4 University Hall, Harvard University, Cambridge, MA 02138

17–19 February 2006
BOSKONE 43 (New England SF conference) at Boston Sheraton, Boston, MA. Guest of Honor: Ken MacLeod; Official Artist: Donato Giancola; Special Guest: Cory Doctorow; Featured Filker: Steve Macdonald. Registration: $43 until 16 January 2006. Info: www.nesfa.org/boskone/; b43info@boskone.org; Boskone 43, Box 809, Framingham, MA 01701; Fax: (617) 776-3243.

24–26 February 2006
SHEVACON 14 (Shenandoah Valley SF conference) Writer Guest of Honor: Catherine Asaro; Artist Guest of Honor: Joe DeVito. Info: http://www.shevacon.org/; registration@shevacon.org; SheVaCon, P.O. Box 416, Verona, VA 24482-0416.

23–27 August 2006
L.A.CON IV (64th World Science Fiction Convention) at Hilton Anaheim, Anaheim Marriott, Anaheim Convention Center, Anaheim, CA. Guest of Honor: Connie Willis. Artist Guest of Honor: James Gurney. Fan Guest of Honor: Howard DeVore. Special Guest: Frankie Thomas (Tom Corbett, Space Cadet). Registration: $150 / C$195 / ?125 / £72 until 14 September 2005. This is the SF universe's annual get-together. Professionals and readers from all over the world will be in attendance. Talks, panels, films, fancy dress competition—the works. Nominate and vote for the Hugos. Info: www.laconiv.org; info@laconiv.org. L.A.con IV, c/o S.C.I.F.I., Inc., Box 8442, Van Nuys CA 91409. International Agents: Canada: Lloyd & Yvonne Penney, 1706-24 Eva Road, Etobicoke, ON M9C 2B2, Canada (Canadian cheques to Lloyd Penney). UK: John Harold, Robbie Bourget, 8 Warren Close, Langley Slough, Berkshire SL3 7UA, UK (UK/Euro cheques to John Harold).■

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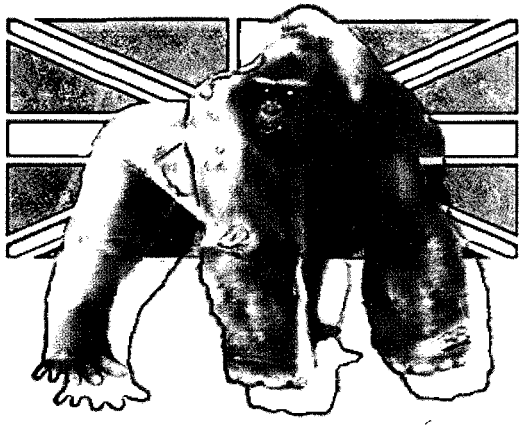

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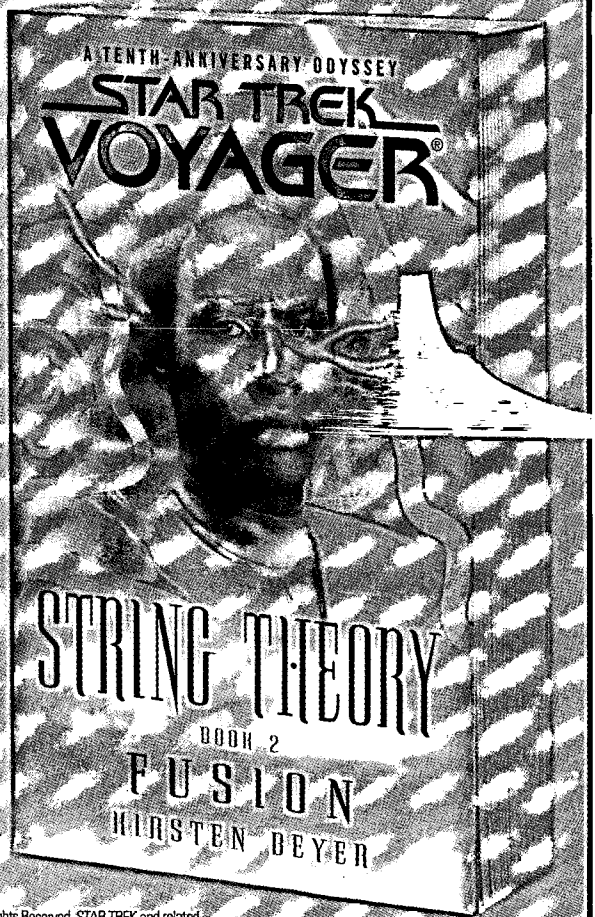

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